Supreme Court, U.S.
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No. 01-

IN THE

Supreme Court of the United States

TOKYO ELECTRON AMERICA, INC.,

Petitioner,

v.

TEGAL CORPORATION,

Respondent.

ON PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

PETITION FOR A WRIT OF CERTIORARI

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January 2, 2002

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QUESTION PRESENTED

Does the Seventh Amendment protect the right to a jury trial of a defendant asserting defenses of noninfringement and invalidity in a patent-infringement action seeking injunctive relief?

LIST OF PARTIES TO THE PROCEEDING PURSUANT TO RULES 14.1(b) AND 29.6

The names of all parties in the court whose judgment is sought to be reviewed appear in the caption of this Petition for a Writ of Certiorari.

The parent company of petitioner, Tokyo Electron America, Inc., is Tokyo Electron Limited. Tokyo Electron Limited is the only publicly held company that owns 10 percent or more of the petitioner's stock.

Petitioner, Tokyo Electron America, Inc., is wholly owned by Tokyo Electron Limited.

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Tokyo Electron America, Inc. ("TEA") respectfully petitions this Court for a writ of certiorari to review the judgment of the United States Court of Appeals for the Federal Circuit.

OPINIONS BELOW

The Federal Circuit's opinion is reported at 257 F.3d 1331, and is reproduced beginning at Appendix page 1a. The Federal Circuit's order denying a petition for rehearing en banc is reproduced beginning at Appendix page 75a. The district court's unreported orders and decision are reproduced beginning at Appendix page 44a.

STATEMENT OF JURISDICTION

The Federal Circuit issued its opinion and entered judgment on July 16, 2001. The Federal Circuit denied TEA's petition for rehearing en banc on September 4, 2001. Chief Justice Rehnquist granted an extension of time for filing this petition to and including January 2, 2002. This Court has jurisdiction under 28 U.S.C. § 1254(1).

CONSTITUTIONAL AND STATUTORY PROVISIONS INVOLVED

The Seventh Amendment of the Constitution provides:

> In Suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury, shall be otherwise re-examined in any Court of the United States, than according to the rules of the common law.

Article 1, section 8, clause 8 of the Constitution provides that Congress shall have the power:

> To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries. . . .

STATEMENT OF THE CASE

This case involves patents covering machines for manufacturing semiconductors, but this petition does not raise technical issues of patent law. Instead, this petition concerns the interpretation of the Seventh Amendment of the Constitution and whether there is a right to trial by jury on infringement and validity issues in a patent case.

Respondent Tegal Corporation ("Tegal") sued TEA alleging infringement of two patents. App. 44a–45a. The patents concern devices used for fabricating semiconductors, such as those contained in computers and other electronic devices. App. 45a–46a. In its complaint, Tegal sought both injunctive relief and damages and demanded a jury trial. App. 10a. As permitted under Rule 39(a) of the Federal Rules of Civil Procedure, TEA relied upon Tegal's jury demand. In its answer, TEA denied Tegal's infringement allegations and asserted affirmative defenses of noninfringement, invalidity, and unenforceability.

Just six days before the trial was to begin, Tegal informed the district court by letter that it had decided not to pursue its damages claim and that it no longer desired a jury trial. App. 10a. On that same day, before TEA had an opportunity to respond, the district court ordered a bench trial. The district

court said, "By withdrawing its damages claim, Tegal loses its right to a jury trial, as no actions at law remain as either affirmative claims or counterclaims." App. 73a–74a. TEA filed a motion for reconsideration of the order directing a bench trial, which the district court denied without opinion. App. 75a–76a.

The district court conducted a three-day bench trial. App. 44a. On Tegal's two infringement claims, the court found for Tegal with regard to one patent but not the other. The court rejected TEA's affirmative defenses of invalidity and unenforceability. App. 60a–64a. TEA timely appealed the final judgment. App. 11a. The Federal Circuit had jurisdiction pursuant to 28 U.S.C. § 1295(a)(1).

The Federal Circuit affirmed in part and reversed in part. With respect to TEA's jury-trial request, the appeals court held that the Seventh Amendment did not apply. App. 13a–17a.

In concluding that TEA was not entitled to a jury trial, the Federal Circuit relied primarily on its prior decision in *In re Lockwood*, 50 F.3d 966 (Fed. Cir.), *cert. granted*, 515 U.S. 1121, *vacated and remanded*, 515 U.S. 1182 (1995). Adhering to the questionable analysis in *Lockwood*, the Federal Circuit found that in eighteenth-century England, a plaintiff patent holder determined whether an alleged infringer had a right to a jury trial based on whether the plaintiff brought a suit in equity or an action at law. App. 16a. Because the patent holder here, Tegal, dropped its damages claim and sought only injunctive relief, the Federal Circuit concluded that TEA was not entitled to a jury trial on its affirmative defenses.

INTRODUCTION AND SUMMARY OF REASONS FOR GRANTING THE WRIT

The Seventh Amendment preserves the right to a jury trial in civil actions "at common law." U.S. CONST. amend. VII. An action "at common law" is one that would have been tried to a jury in English law courts, as opposed to equity or admiralty courts, in the eighteenth century. *See Tull v. United States*, 481 U.S. 412, 417 (1987). The historical test for applying the Seventh Amendment, which requires reference to English practice as of 1791, has been set forth many times, including in the recent patent case of *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 377 (1996).

This Court has described the constitutional right to a jury trial as "a fundamental guarantee of the rights and liberties of the people." *Parsons v. Bedford*, 28 U.S. 433, 446 (1830) (Story, J.). This fundamental guarantee extends to defendants as well as plaintiffs. *See Dairy Queen, Inc. v. Wood*, 369 U.S. 469 (1962).

This familiar and settled law regarding the Seventh Amendment applies equally in patent cases. *See Markman*, 517 U.S. at 377. In *Markman*, this Court concluded that "there is no dispute that infringement cases today must be tried to a jury, as their predecessors were more than two centuries ago." *Id.*

Instead of following *Markman* and other decisions of this Court, the Federal Circuit substituted an erroneous analysis drawn from its own decision in *Lockwood* — a decision this Court decided to review on certiorari and subsequently vacated. The Federal Circuit's analysis in *Lockwood* and here grants a plaintiff alleging patent

infringement the right to deny the defendant a jury trial on infringement and validity issues. Because of the Federal Circuit's exclusive jurisdiction over patent appeals, its decision here will have a nationwide impact.

The decision below significantly curtails the scope of Seventh Amendment rights in patent cases. Because of the importance of the issue presented and the dramatic departure from this Court's precedents, the decision merits review.

REASONS FOR GRANTING THE WRIT

I. THE SEVENTH AMENDMENT ISSUE PRESENTED HERE IS ONE OF NATIONAL IMPORTANCE

A. THE SIGNIFICANCE OF THE ISSUE HERE IS SHOWN BOTH BY THIS COURT'S ABIDING CONCERN FOR SEVENTH AMENDMENT RIGHTS AND BY THE GRANT OF CERTIORARI IN THE CASE THAT FORMED THE BASIS FOR THE DECISION BELOW

This Court has long recognized the importance of the Seventh Amendment right to a jury trial. *See, e.g., Parsons v. Bedford*, 28 U.S. 433, 446 (1830). Accordingly, in cases involving encroachments on that right, this Court has repeatedly decided to grant certiorari because " 'any seeming curtailment of the right to a jury trial should be scrutinized with the utmost care.' " *Chauffeurs Local No. 391 v. Terry*, 494 U.S. 558, 565 (1990) (quoting *Beacon Theatres, Inc. v. Westover*, 359 U.S. 500, 501 (1959), in turn quoting *Dimick v. Schiedt*, 293 U.S. 474, 486 (1935)).

The Seventh Amendment has heightened importance in patent cases. *See Markman v. Westview Instruments, Inc.*, 517 U.S. 370 (1996). Issues of patent validity affect not only the particular litigants, but also the public at large. *Cardinal Chem. Co. v. Morton Int'l, Inc.*, 508 U.S. 83, 100 (1993) (citing *Blonder-Tongue Labs. Inc. v. Univ. of Ill. Found.*, 402 U.S. 313 (1971)). The economic significance of those issues is, in the aggregate, enormous, and growing. *See* Matthew B. Zisk, *Mediation and Settlement of Patent Disputes in the Shadow of the Public Interest*, 14 OHIO ST. J. ON DISP. RESOL. 481, 491 (1999); Roderick R. McKelvie, *Problems of Complex Litigation*, 9 FED. CIR. B.J. 529, 530 (2000); ADMIN. OFFICE OF U.S. COURTS, ANNUAL REPORT table C–2A (2000).

This case presents an important question regarding the scope of the right to a jury trial in patent cases. This Court's grant of certiorari in the case that formed the basis for the Federal Circuit's decision here demonstrates the propriety of review. *See In re Lockwood*, 50 F.3d 966 (Fed. Cir.), *cert. granted*, 515 U.S. 1121, *vacated and remanded*, 515 U.S. 1182 (1995).

In *Lockwood*, the patent holder brought suit against the alleged infringer, who counterclaimed for a declaration of patent invalidity. The district court dismissed the plaintiff's infringement claim on summary judgment, so that only the alleged infringer's invalidity counterclaim was left for trial. The patent holder (the plaintiff and counterclaim defendant) requested a jury trial, but the trial court rejected that request on the theory that the invalidity counterclaim was "equitable in nature." 50 F.3d at 969.

The Federal Circuit granted a writ of mandamus and held that the Seventh Amendment right applied. The *Lockwood*

panel addressed essentially the same question as here: the defendant's (or counterclaim defendant's) right to a jury trial on the patent-validity issue where damages were no longer in controversy. Judge Nies dissented from an order denying rehearing en banc in *Lockwood*, saying, "No more important nor contentious an issue arises in patent law jurisprudence than the appropriate role of juries in patent litigation." 50 F.3d at 980–81.

After this Court granted certiorari in *Lockwood*, however, it had no opportunity to address the important Seventh Amendment question presented. Lockwood abandoned his request for a jury trial, and this Court accordingly vacated the Federal Circuit's decision. *See* 1995 WL 848568 (motion to dismiss as moot); 1995 WL 848570 (reply to response regarding motion); 515 U.S. 1182 (1995) (vacating decision).

Here, the Federal Circuit relied primarily on its *Lockwood* analysis on the grounds that *Lockwood* had "been neither supplanted nor questioned." App. 15a. The principal distinction the Federal Circuit drew between *Lockwood* and this case concerned the position of the parties. In its view, a patent holder opposing a claim of patent invalidity (*Lockwood*) is entitled to a jury trial, whereas an accused infringer opposing an infringement claim by asserting patent invalidity (this case) is not. That distinction flies in the face of this Court's decisions, which hold that the nature of the issues (rather than the position of the parties) determines the right to a jury trial. *See, e.g., Chauffeurs*, 494 U.S. at 564; *Ross v. Bernhard*, 396 U.S. 531, 532–33 (1970); *Dairy Queen, Inc. v. Wood*, 369 U.S. 469, 477–79 (1962).

The Federal Circuit also noted that TEA asserted affirmative defenses but no counterclaims. App. 12a. There

is, however, no valid constitutional distinction between an invalidity defense and an invalidity counterclaim. In *Dairy Queen*, the defendant asserted affirmative defenses but no counterclaims, and this Court concluded that the defendant was entitled to a jury trial based in part on those affirmative defenses. 369 U.S. at 477–78. It said, "[T]he constitutional right to trial by jury cannot be made to depend upon the choice of words used in the pleadings." *Id.*; *see also* FED. R. CIV. P. 8(c) ("When a party has mistakenly designated a defense as a counterclaim or a counterclaim as a defense, the court on terms, if justice so requires, shall treat the pleading as if there had been a proper designation.").

In sum, the importance of the Seventh Amendment right to a jury trial in patent cases involving validity issues is shown by this Court's decisions addressing Seventh Amendment rights in other contexts and by this Court's decision to review the Federal Circuit's ruling in *Lockwood*, the case that supplied the rationale for the Federal Circuit's decision here.

B. THE FEDERAL CIRCUIT'S EXCLUSIVE JURISDICTION OVER PATENT CASES AND THE FREQUENT RECURRENCE OF THE JURY-TRIAL ISSUE MAGNIFY THE NEED FOR REVIEW

The nature of the Federal Circuit's jurisdiction magnifies the significance of the Seventh Amendment issue presented here. Congress vested the Federal Circuit with exclusive jurisdiction over appeals in all patent cases. 28 U.S.C. § 1295. Absent review by this Court, the Federal Circuit's decision in this case will restrict defendants' Seventh Amendment rights in patent cases in district courts in all circuits.

The issue presented here is a recurring one on which the Federal Circuit has been inconsistent, making review particularly appropriate. In addition to *Lockwood*, the Federal Circuit addressed the jury-trial issue in *In re SGS-Thomson Microelectronics, Inc.*, 60 F.3d 839, 1995 WL 258370 (Fed. Cir.) (unpublished), *cert. denied*, 516 U.S. 931 (1995). In *SGS-Thomson*, unlike here, the appeals court concluded that a defendant in a patent case was entitled to a jury trial on the validity and infringement issues, even though the plaintiff did not seek damages. In *SGS-Thomson*, the Federal Circuit rejected the principle, which it employed here, that the patent holder's requested relief controls the right to a jury trial. The Federal Circuit's vacillation between *SGS-Thomson*, *Lockwood*, and this case shows the need for clarification of the law on this issue.

The need for review is also indicated by the disagreement in the district courts regarding the Seventh Amendment right in patent cases where defendants assert noninfringement and invalidity. *Compare, e.g., Hoechst Marion Roussel, Inc. v. Par Pharm., Inc.*, 39 U.S.P.Q.2d 1363, 1365, 1996 WL 468593 (D.N.J.) (holding defendant in patent case entitled to jury trial), *appeal granted*, 95 F.3d 1165 (Fed. Cir. 1996), *and Zeneca Ltd. v. Pharmachemie B.V.*, No. 96–12413, 1998 WL 1013126, at *1 (D. Mass. Oct. 8, 1998) (same), *and Warner-Lambert Co. v. Purepac Pharm. Co.*, No. 98–2749, 2001 WL 883232 (D.N.J. Mar. 30, 2001) (same) *with Pfizer Inc. v. Novopharm Ltd.*, No. 00 C 1475, 2001 WL 477163, at *4 (N.D. Ill. May 3, 2001) (no right to jury trial) *and Glaxo Group Ltd. v. Apotex, Inc.*, No. 00 C 5791, 2001 WL 1246628, at *1 (N.D. Ill. Oct. 16, 2001) (same).

Thus, this Court's decisions, including its grant of certiorari in *Lockwood*, the Federal Circuit's unique

jurisdiction over appeals in patent cases, the inconsistency of the Federal Circuit's decisions, and the uncertainty in the district courts all demonstrate that the constitutional question presented here is an important one that merits review.

II. THE DECISION BELOW DRAMATICALLY DEPARTS FROM DECISIONS OF THIS COURT

In *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 377 (1996), this Court spoke directly to the availability of juries in patent cases. There, this Court restated and applied the settled test for determining whether the Seventh Amendment applies. *See, e.g., id.*; *Tull v. United States*, 481 U.S. 412, 417 (1987). Here, however, the Federal Circuit discarded this Court's established guidelines and instead substituted a novel and erroneous approach to the Seventh Amendment.

In *Markman*, this Court left no doubt as to the availability of juries under the Seventh Amendment in patent cases. The Court set out the familiar rule that "[t]he right of trial by jury thus preserved is the right which existed under the English common law when the [Seventh] Amendment was adopted." 517 U.S. at 376. Under this historical test, a court should, when making a Seventh Amendment ruling, consider whether it is "dealing with a cause of action that either was tried at law at the time of the founding or is at least analogous to one that was." *Id.*

The *Markman* Court described as "familiar . . . the descent of today's patent infringement action from the infringement actions tried at law in the 18th century. . . ." 517 U.S. at 377. The Court concluded, "[T]here is no dispute that infringement cases today must be tried to a jury, as their predecessors were more than two centuries ago." *Id.* (citing *Bramah v. Hardcastle*, 1 Carp. P.C. 168 (K.B. 1789)).

In addition to *Bramah v. Hardcastle*, other leading eighteenth-century cases confirm the Court's conclusion in *Markman*. *See, e.g.*, *Turner v. Winter*, 1 T.R. 602, 605 (K.B. 1787) (patent case tried to a jury); *Arkwright v. Nightingale*, Davies 37, 55 (C.P. 1785) (patent case tried to a jury where no damages were sought); *The King v. Else*, 1 Carp. P.C. 103, Davies 144, 145 (K.B. 1785) (directing jury verdict of patent invalidity); *Liardet v. Johnson* (K.B. 1778) (report set out in E. Wyndham Hulme, *On the History of Patent Law in the Seventeenth and Eighteenth Centuries*, 18 THE LAW QUARTERLY REVIEW 280, 283–87 (1902)) (patent case brought in Chancery transferred to law court and tried to a jury because invalidity is a legal issue requiring jury determination).

In addition, leading treatises from the late eighteenth century and later support this Court's conclusion in *Markman*. *See* 2 F. BULLER, AN INTRODUCTION TO THE LAW RELATIVE TO TRIALS AT *NISI PRIUS* Ch. VII (6th ed. 1791) (describing procedures in common-law courts in patent cases); 3 WILLIAM BLACKSTONE, COMMENTARIES ON THE LAWS OF ENGLAND 422 (Wm. Hardcastle Browne ed. 1897) (1768); 2 JOSEPH STORY, COMMENTARIES ON EQUITY JURISPRUDENCE § 1264 (14th ed. 1918) (when an injunction is sought and patent validity has not been determined by law or usage, it is "to be ascertained by a trial in a Court of Law"); 11 WILLIAM HOLDSWORTH, A HISTORY OF ENGLISH LAW 424–25 n.12 (1938) ("It is reasonably clear that the statute [of monopolies] intended to give the common law courts jurisdiction over the validity of the patents of monopoly. . . .").

These cases and treatises make clear that validity and infringement issues in patent cases were tried to juries as of 1791. This was true even when equitable relief rather than legal relief (damages) was sought. *See, e.g.*, *Newsham v. Gray*,

2 Atk. [2d ed. 1794] 286, 286–87 (Ch. 1742). In such cases, the suit was initiated in Chancery. *See id.* When, however, the suit in Chancery involved factual issues bearing on validity and infringement raised by the defendant, the case was directed to a law court for a jury trial and then, if necessary, returned to Chancery. *See, e.g., id.*; 3 BLACKSTONE, COMMENTARIES 422; Coke, 4 Inst. 80 (1797); JOHN DAVIES, A COLLECTION OF THE MOST IMPORTANT CASES RESPECTING PATENTS OF INVENTION AND THE RIGHTS OF PATENTEES ix (1816); MIDDLE TEMPLE, GENERAL ABRIDGMENT OF CASES IN EQUITY 128 (1739).

Despite this authority, the Federal Circuit dismissed this Court's conclusion in *Markman* concerning the jury-trial right in patent cases as being a "cursory disposal of the issue" that provided "no guidance." App. 14a–15a. The appeals court also suggested that *Markman* could be distinguished based on a possible claim for damages. App. 15a.

The Federal Circuit based that distinction on a misunderstanding of this Court's Seventh Amendment cases. Under these cases, the constitutional question is whether juries in late eighteenth-century English common-law courts would have resolved the issue in dispute — not simply whether damages were sought. *Curtis v. Loether*, 415 U.S. 189, 193 (1974). This flows from the constitutional language preserving the jury-trial right "in Suits at common law." To be sure, in cases involving statutory causes of action unknown at common law, courts must consider both the nature of the claim and the requested remedy. *See, e.g., Tull*, 481 U.S. at 417. In such cases, the presence of a damages claim weighs in favor of finding a jury-trial right, though it is not dispositive. *See, e.g., id.* at 421 & n.6. But here, in view of the ample eighteenth-century authority establishing the right to a jury trial in patent cases without regard to whether damages were sought, an analysis of the requested remedy is unnecessary.

Instead of following *Markman*, the Federal Circuit relied on its own prior analysis in the vacated *Lockwood* decision. The Federal Circuit's casual disregard of *Markman* ignores stare decisis and the authority of this Court. In addition, given the Federal Circuit's continuing reliance on *Lockwood*, it is significant that the analysis in *Lockwood* is at odds with other Supreme Court decisions.

In *Lockwood* and in the decision below, the Federal Circuit concluded that the jury-trial right of a defendant in an infringement case was controlled by the patent holder. 50 F.3d at 976. According to the Federal Circuit's approach, the defendant's right to a jury trial exists if the patent holder seeks damages, but does not exist if the patent holder seeks only an injunction. The historical analysis that underlies this approach is erroneous, and the Federal Circuit's conclusion cannot be squared with this Court's cases, including *Markman*, *Beacon Theatres*, and *Dairy Queen*, or with common-law authorities.

In *Beacon Theatres*, this Court made clear that a defendant's Seventh Amendment right does not depend on whether the plaintiff seeks damages. 359 U.S. at 504. The plaintiff in *Beacon Theatres* sought a declaratory judgment that it had not violated the antitrust laws. This Court rejected the appeals court's holding that the plaintiff's complaint, read as a whole, governed the jury-trial right. *Id.* at 504–05. The Court determined instead that the defendant was entitled to "a full jury trial" on its antitrust counterclaim as well as the plaintiff's claim for declaratory relief. *Id.* at 508.

In *Dairy Queen*, this Court addressed another challenge to a defendant's Seventh Amendment right where the plaintiff sought only equitable relief (an injunction and an accounting) and the defendant raised legal issues in its affirmative defenses. 369 U.S. at 475–76. To determine the Seventh Amendment's applicability, this Court considered, along with the issues raised by the plaintiff's complaint, the "nature of the defenses interposed" by the defendant. *Id.* at 479. The Court held that the defendant was entitled to a jury trial on both the issues raised by the complaint and the issues raised by the defenses. *Id.*

Beacon Theatres and *Dairy Queen* show that a defendant's jury-trial right extends to legal issues raised by affirmative defenses and is not undermined by a plaintiff's claim for equitable relief. This understanding accords with Blackstone, Coke, Buller, and the other common-law authorities previously discussed. In finding no right to a jury here, the Federal Circuit failed to follow this Court's Seventh Amendment cases. This error strongly supports review.

CONCLUSION

This Court's grant of certiorari in *Lockwood* strongly indicates the importance of the Seventh Amendment issue presented here. This issue is a recurring one which has received inconsistent treatment by the Federal Circuit and by lower courts. The Federal Circuit has disregarded this Court's cases on an issue of national importance. For all the reasons discussed above, this case merits review.

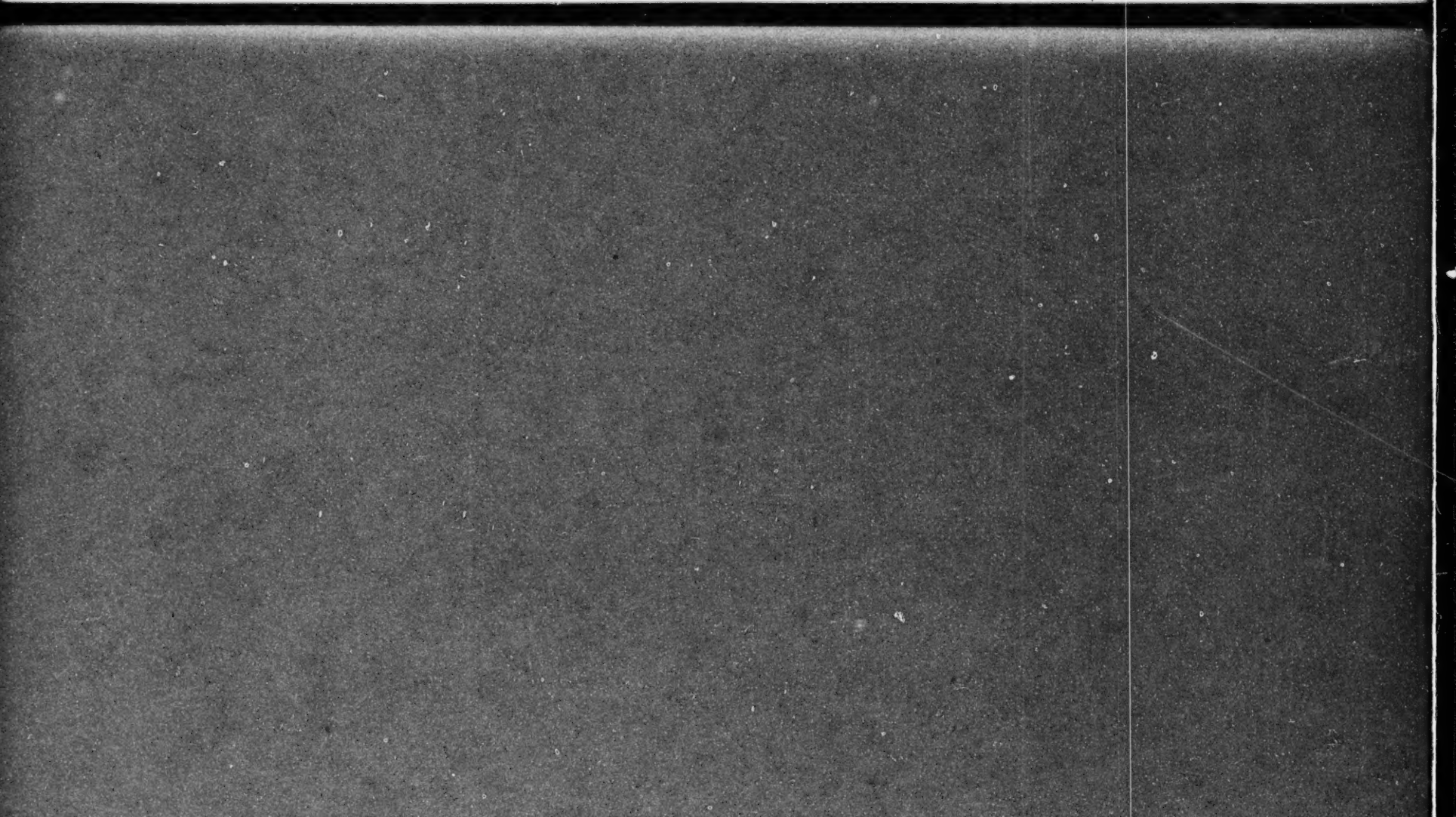
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APPENDIX



APPENDIX A — OPINION AND JUDGMENT OF THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT DATED AND DECIDED JULY 16, 2001

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

00-1009

TEGAL CORPORATION,

Plaintiff-Appellee,

v.

TOKYO ELECTRON AMERICA, INC.,

Defendant-Appellant.

00-1209

TEGAL CORPORATION,

Plaintiff-Appellee,

v.

TOKYO ELECTRON AMERICA, INC.,

Defendant-Appellant.

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00-1307

TEGAL CORPORATION,

Plaintiff-Appellee,

v.

TOKYO ELECTRON AMERICA, INC.,

Defendant-Appellant.

DECIDED: July 16, 2001

Before LOURIE, BRYSON, and LINN, *Circuit Judges*.

LINN, *Circuit Judge*.

Three appeals are addressed in this opinion. In the first, Tokyo Electron America, Inc. ("TEA") seeks review of a final judgment of infringement from the District Court for the Eastern District of Virginia. *Tegal Corp. v. Tokyo Electron Am., Inc.*, No. 3:98CV318 (E.D. Va. Aug. 31, 1999) ("*Opinion*"). Specifically, TEA challenges the following holdings from the district court's opinion: (1) TEA was not entitled to a jury trial; (2) claims 1 and 7 of U.S. Patent No. 4,464,223 (" '223 patent"), issued after reexamination as U.S. Patent No. B1 4,464,223,[1] are not invalid under

1. The final result of the reexamination was a Reexamination Certificate that includes the first page of the original patent and the new claims but does not include the remainder of the written description. Accordingly, citations to the written description will be from the original patent (" '223 patent") and citations to the claims will be from the Reexamination Certificate (" '223 Reexam. Cert.").

35 U.S.C. § 102(b) as being anticipated by the Itakura reference; (3) claims 1 and 7 of the '223 Reexamination Certificate are not invalid under 35 U.S.C. § 103(a) as being obvious over the Nippon Telegraph and Telephone Corp. ("NTT") reference; (4) the claims of the '223 Reexamination Certificate are not unenforceable for the failure of Tegal Corp. ("Tegal") to disclose the NTT reference; (5) TEA willfully infringed claims 1 and 7 of the '223 Reexamination Certificate, both before and after Tegal filed suit; and (6) the case was exceptional, under 35 U.S.C. § 285, and merited attorney fees for Tegal. TEA also appeals the injunction issued against it by the district court, maintaining that it is overbroad. We affirm the district court's decision with respect to: (1) neither party having a right to a jury trial; (2) the finding of infringement; (3) the decision that the claims of the '223 Reexamination Certificate are enforceable; and (4) the non-obviousness decision. However, we vacate and remand: (1) the finding that Itakura did not anticipate the '223 patent; (2) the findings of pre-filing and post-filing willfulness; (3) the finding of an exceptional case; (4) the award of attorney fees; and (5) the entry of the injunction.

In the second appeal, TEA seeks review of a final order awarding Tegal attorney fees in the amount of $842,129.03. *Tegal Corp. v. Tokyo Electron Ltd., Inc.*, No. 3:98CV318 (E.D. Va. Jan. 20, 2000).[2] In its appeal brief, TEA does not dispute the actual amount of the award. Rather, TEA argues that the award was made in error because it rested on the allegedly faulty findings that TEA had willfully infringed

2. The caption on the district court's order incorrectly names Tokyo Electron Limited, Inc., the appellant's parent corporation, instead of the appellant.

and that this was an exceptional case. As the parties were informed at the oral hearing, these arguments were fully briefed in the first appeal and there are no additional issues to be considered in the second appeal.

In the third appeal, TEA seeks review of a final order which clarified that the injunction extends to plasma etchers originally sold before Tegal began marking in accordance with 35 U.S.C. § 287(a). *Tegal Corp. v. Tokyo Electron Ltd.*, No. 3:98CV318 (E.D. Va. Mar. 17, 2000).[3] In light of our vacating the injunction in question, the issue presented in this third appeal is moot.

BACKGROUND

A. The '223 Patent

The '223 patent is directed to plasma reactors, which are used in the fabrication of semiconductor devices. In a plasma reactor, sometimes called an "etcher," gas is injected into a low-pressure, sealed chamber where it reacts with an electric field established between electrodes to create a plasma. Although the construction of the claim terms "plasma" and "electrode" are debated issues in this appeal, some general comments can be made at this point. The plasma is created in a process called dissociation in which the electric field imparts energy to the gas within the chamber. Although a number of reactions and collisions occur between the particles in the chamber, the critical one for the purpose of plasma etching is the creation of positively charged ions.

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3. The caption on the district court's order incorrectly names Tokyo Electron Ltd., the appellant's parent corporation, instead of the appellant.

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In the etcher, the ions are induced to strike a wafer surface, or "workpiece," situated within the chamber, with sufficient force to strip material away from the workpiece. By controlling the ion behavior, extremely precise patterns can be created, thus allowing miniaturization of semiconductor devices. Two variables that are important in controlling the ion behavior are the ion energy and the ion density. Preferably, the ion energy and the ion density can be kept at high levels. However, prior to the '223 patent, this was allegedly not possible. '223 patent, col. 2. The '223 patent teaches that standard prior art etchers applied an alternating-current ("AC") electric field between the etcher's electrodes that was at either a low frequency or a high frequency. *See id.* High frequencies increased the ion density, allowing a high etch-uniformity, but did not produce high ion energy. *Id.* Low frequencies, conversely, increased the ion energy, allowing a high etch-rate, but did not produce high ion density. *Id.* The '223 patent discloses a method and apparatus for maintaining both of these variables at a higher level by applying both a high frequency and a low frequency simultaneously to certain electrodes in the etcher. *Id.* at cols. 1-2. This allows both a high etch-rate and high etch-uniformity. *Id.*

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Figure 2 of the '223 patent, reproduced below, discloses an embodiment of the claimed invention.

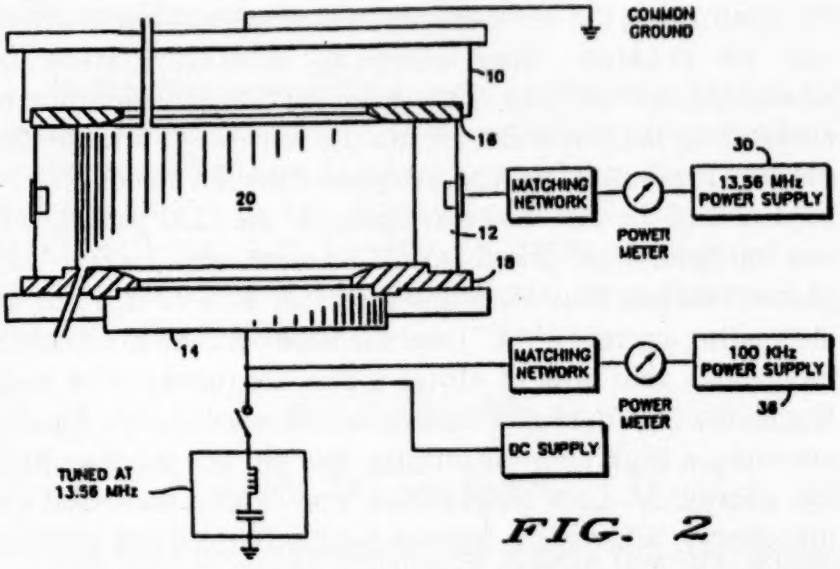


FIG. 2

Figure 2 is a cross-sectional view of a triode etcher, an etcher with three electrodes 10, 12, 14. Conversely, much of the prior art, though not all, utilizes diode etchers, which include only two electrodes. The first electrode 10 and the third electrode 14 are generally circular, that is, shaped like a flat plate. '223 patent, col. 2. The second electrode 12 is ring-shaped. *Id.* Ring-shaped ceramic insulators 16, 18 provide electrical isolation between the first 10 and second 12 electrodes and the second 12 and third 14 electrodes, respectively. *Id.* The three electrodes 10, 12, 14 and two insulators 16, 18 bound the generally cylindrical reaction volume 20. *Id.*

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In a preferred embodiment of the invention, the high frequency power supply 30 is coupled to the second electrode 12, a low frequency power supply 36 is coupled to the third electrode 14, and a common ground is coupled to the first electrode 10. *Id.* at cols. 2-3. After a workpiece is placed on the third electrode 14 and the chamber is evacuated to the desired low pressure, the power supplies 30, 36 are energized. *Id.* at col. 3. The two power supplies 30, 36 create a plasma within the reaction volume, *id.*, and cause "maximum dissociation . . . as well as imparting a high ion energy to the ions within the plasma," *id.* at col. 3, ll. 41-42.

TEA was found to infringe claims 1 and 7 of the '223 Reexamination Certificate. Those claims are reproduced below.

> 1. A reactor apparatus including a reaction volume into which reactants are injected and from which reaction products are exhausted, and in which said reactants are acted upon by electric fields to form a plasma thereof, said apparatus comprising:
>
> first, second, and third electrodes,
>
> said first electrode coupled to electrical ground,
>
> said second electrode selectively coupled to a high frequency source of AC power,
>
> said third electrode selectively coupled to a low frequency source of AC power, and
>
> wherein one of said electrodes is adapted for holding a workpiece.

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7. A plasma reactor for treating a workpiece in a glow discharge comprising:

first, second, and third electrodes separated by insulators for defining a reaction volume in which said workpiece is located;

means for admitting reactants to said reaction volume and for removing reaction products from said reaction volume;

a first high frequency AC power supply coupled between said first electrode and said second electrode;

a second low frequency AC power supply coupled between said first electrode and said third electrode;

an electrical ground coupled to said first electrode;

said first and second power supplies producing different frequencies respectively above about 10 Mhz and below about 1 Mhz for causing a glow discharge in said volume.

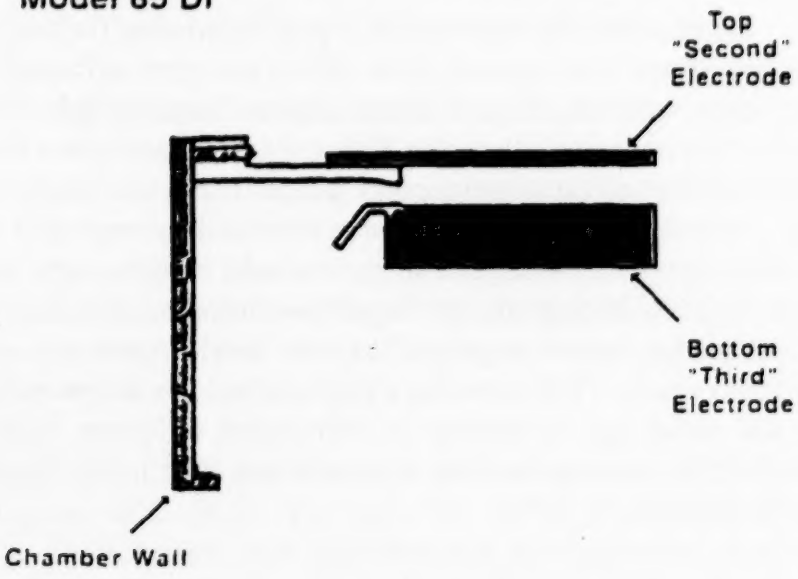
'223 Reexam. Cert., col. 1, ll. 25-37 (claim 1), col. 2, ll. 19-43 (claim 7).

B. The Accused Device

TEA challenges the district court's judgment that TEA's IEM etchers, models 65DI and 85DI, infringe the '223 patent. A diagram showing the pertinent aspects of Model 85DI is reproduced below.

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TEA's Chamber from Process Manual Model 85 DI



The diagram depicts top and bottom electrodes and a grounded chamber wall. TEA does not dispute that the top and bottom electrodes are connected to high and low frequency power supplies. In operation, a workpiece is placed on the bottom electrode and the top and bottom electrodes are powered, creating a plasma.

The parties' dispute in this case centers on two aspects of the IEM etchers. First, the parties dispute whether the plasma, as properly construed, is confined to the volume between the top and bottom electrodes, or whether it is merely concentrated there and extends to the grounded chamber wall. Second, the parties disagree on whether the grounded chamber wall is an electrode, when that term is properly construed.

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C. Procedural History

Tegal initially requested a jury trial for its patent infringement suit against TEA. TEA asserted affirmative defenses without filing a counterclaim. Tegal sought both injunctive relief and damages. However, six days before trial, Tegal informed the district court judge that it was dropping its claim for damages. Tegal's understanding was that by withdrawing its damages claim, it would lose its right to a trial by jury. In response to Tegal's withdrawal, the district court judge issued an order that the trial would proceed without a jury. TEA, desiring a jury trial on the issues raised in the pleadings, including its affirmative defenses, filed a motion for reconsideration of that order, which the district court denied.

After a bench trial, the district court issued an opinion finding that claims 1 and 7 of the '223 Reexamination Certificate are not invalid, are enforceable, and were willfully infringed by TEA. Due to TEA's willful infringement, the district court found that the case was exceptional and awarded attorney fees to Tegal. As a further remedy, the district court entered an injunction against TEA. Paragraphs six and seven of the injunction are relevant to this appeal and provide:

> 6. Until October 3, 2003 (the expiration date of the '223 Patent), TEA is hereby permanently enjoined from engaging in any further infringement or infringement by equivalents of Claims 1 and 7 of the '223 Patent and is specifically barred from making, using, offering for sale, selling or importing any of the IEM model

> etching systems found to infringe said Claims in this case;
>
> 7. The infringing activities enjoined in paragraph 6 include acts that constitute contributory infringement or inducement to infringement, such as participating in, rendering assistance, or [in] any way facilitating infringing acts by related corporations or corporate affiliates or corporate parents, or conducting field service, testing or spare parts replacement or maintenance for customers that own infringing etching systems which were sold after October, 1997;

Tegal Corp. v. Tokyo Electron Am., Inc., No. 3:98CV318, slip op. at 2 (E.D. Va. Oct. 13, 1999) ("*Injunction*"). The district court later clarified that the injunction applied to etchers sold before Tegal began marking, thus barring TEA's later reselling of those etchers.

TEA appeals the district court's validity, enforceability, infringement, willfulness, and exceptional case findings, as well as the scope of the injunction and the award of attorney fees.[4] We have exclusive appellate jurisdiction. 28 U.S.C. § 1295(a)(1) (1994).

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4. The district court also found that the '223 patent was not infringed by another TEA product and that a second patent, U.S. Patent No. 4,585,920, was not infringed by TEA. Tegal does not appeal these findings.

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DISCUSSION

A. Standard of Review

"On appeal from a bench trial, we review a district court's decision for errors of law and clearly erroneous findings of fact." *Brown & Williamson Tobacco Corp. v. Philip Morris Inc.*, 229 F.3d 1120, 1123, 56 USPQ2d 1456, 1458 (Fed. Cir. 2000). A factual finding is clearly erroneous when, "although there is evidence to support [the factual finding], the reviewing court on the entire evidence is left with the definite and firm conviction that a mistake has been committed." *United States v. United States Gypsum Co.*, 333 U.S. 364, 395 (1948). Given the large number of issues, the specific standards of review for the individual issues are not set out in this section, but are included individually in the separate sections discussing each issue.

B. Jury Trial

The threshold issue before the court in the first appeal is whether a defendant, asserting only affirmative defenses and no counterclaims, has a right to a jury trial when the only remedy sought by the plaintiff-patentee is an injunction. That issue is a matter of first impression. As explained below, we hold that such a defendant does not have a right to a jury trial.

The constitutional question of whether a party is entitled to a jury trial is a question of law that this court reviews de novo. *E.g.*, *Demko v. United States*, 216 F.3d 1049, 1052 (Fed. Cir. 2000) (stating that "the issue of the constitutionality of a

statute is also a question of law, which this court reviews completely and independently"); *Medline Indus., Inc. v. United States*, 62 F.3d 1407, 1409 (Fed. Cir. 1995) (stating that "questions of law are subject to full and independent review (sometimes referred to as 'de novo' or 'plenary' review)").

TEA challenges the district court's decision to conduct a bench trial, arguing that: (1) TEA had an independent right to a jury trial; (2) the district court improperly focused only on the nature of the remedy — injunctive relief only — as opposed to the nature of the action; and (3) the district court violated Federal Rules of Civil Procedure 38(d) and 39(a).

TEA's first two arguments can be addressed together by applying the Supreme Court's test for determining if a right to a jury attaches to a particular case. The inquiry turns on whether the case "is more similar to cases that were tried in courts of law than to suits tried in courts of equity or admiralty" in 1791. *Tull v. United States*, 481 U.S. 412, 417 (1987); *Granfinanciera, S.A. v. Nordberg*, 492 U.S. 33, 41-42 (1989) (identifying 1791 as the relevant date). A right to a jury attaches only to cases more similar to those that were tried in courts of law. *Tull*, 481 U.S. at 417. To resolve this inquiry, the Supreme Court has repeatedly taught that courts must examine both the nature of the action involved and the remedy sought, and that the nature of the remedy is more important than that of the action. *Chauffeurs, Local No. 391 v. Terry*, 494 U.S. 558, 565 (1990); *Tull*, 481 U.S. at 417, 421. That examination requires that, "[f]irst, we compare the statutory action to 18th-centrury actions brought in the courts of England prior to the merger of the courts of law and equity[, and,] [s]econd, we examine the remedy sought and

determine whether it is legal or equitable in nature." *Tull*, 481 U.S. at 417-18.

The action in this case is a claim of patent infringement, seeking an injunction and no damages, with invalidity issues asserted in affirmative defenses. With regard to the right to a jury trial, there is no binding precedent from this court comparing the kinds of issues involved in this action with those arising in actions in eighteenth century England. TEA cites to our opinions in *Gardco Manufacturing, Inc. v. Herst Lighting Co.*, 820 F.2d 1209, 2 USPQ2d 2015 (Fed. Cir. 1987), and *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 34 USPQ2d 1321 (Fed. Cir. 1995) (en banc), *aff'd*, 517 U.S. 370, 38 USPQ2d 1461 (1996), but neither of these is pertinent. *Gardco* deals with the commonality of factual issues between an unenforceability analysis and an infringement/validity analysis, and holds that there is no commonality preventing a court from trying the unenforceability issue without a jury before having a jury trial on the infringement/validity issues. *Gardco*, 820 F.2d at 1213, 2 USPQ2d at 2019. The reference in *Markman* to which TEA directs us, stating that a patent creates "federal legal rights," does not distinguish between legal rights that arise in equity and those that arise in law. *Markman*, 52 F.3d at 978, 34 USPQ2d at 1329.

The Supreme Court briefly addressed the issue before us in its affirmance of our *Markman* opinion, stating in a conclusory manner that "there is no dispute that infringement cases today must be tried to a jury, as their predecessors were more than two centuries ago." *Markman*, 517 U.S. at 377, 38 USPQ2d at 1465. The Supreme Court's cursory disposal

of the issue was entirely understandable and appropriate because damages were requested in the original trial litigation. *See Markman*, 52 F.3d at 973, 34 USPQ2d at 1324 (suggesting that damages were involved by noting the trial testimony concerning the number of infringing systems sold); *id.* at 1002, 34 USPQ2d at 1348 (Newman, J., dissenting) (stating that damages were at issue, but severed from the infringement trial). Thus, the Supreme Court's affirmance provides no guidance on how to analyze the case before us, in which damages are not at issue.

This court has, however, provided a relevant and detailed analysis in *In re Lockwood*, 50 F.3d 966, 33 USPQ2d 1406 (Fed. Cir. 1995), *vacated*, 515 U.S. 1182 (1995). The Supreme Court vacated *Lockwood* without explanation.[5] Thus, our analysis has been neither supplanted nor questioned. Although no longer binding, we find its reasoning pertinent. In *Lockwood*, the patentee brought an infringement action against American Airlines, seeking damages and an injunction, and demanding a jury trial. *Id.* at 968, 33 USPQ2d at 1407. American Airlines counterclaimed for a declaration that the asserted patents were invalid or unenforceable. *Id.* The district court awarded summary judgment of noninfringement and struck the patentee's demand that the issue of validity be tried to the jury. *Id.* at 968-69, 33 USPQ2d at 1407-08. On appeal, this court held that the patentee had a

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5. After the Supreme Court granted certiorari, Lockwood withdrew his request for a jury trial, thus mooting the issue before the Supreme Court. *See* 515 U.S. 1121 (1995) (granting certiorari); 1995 WL 848568 (Lockwood's motion asking the Supreme Court to dismiss his case as moot); 1995 WL 848570 (Lockwood's reply to the response from American Airlines).

right to a jury trial in the remaining declaratory judgment action to determine validity. *Id.* at 980, 33 USPQ2d at 1417.

Of import to the present case is the discussion in *Lockwood* of the nature, in eighteenth century England, of a patent infringement action with invalidity defenses asserted by the alleged infringer. *Id.* at 976, 33 USPQ2d at 1414. *Lockwood* explained that "[i]n eighteenth-century England, allegations of patent infringement could be raised in both actions at law and suits in equity," and that the choice was the patentee's and depended on the type of remedy sought. *Id.* If the patentee sought an injunction and an accounting, the patentee went to a court of equity. *Id.* If, however, the patentee sought only damages, a court of law was used. *Id.* Applying that framework to the present case, and given Tegal's interest only in an injunction, it is clear that Tegal would have needed, in eighteenth century England, to bring its case in a court of equity. We see no reason to depart from the framework provided in *Lockwood*, particularly given that TEA presents no analysis at all of the appropriate 1791 analog. Accordingly, the nature of Tegal's action is equitable.

The second prong of the Supreme Court's test, the more important prong, inquires into the nature of the remedy sought. Little analysis is required; Tegal sought only an injunction, a purely equitable remedy. Considering the two prongs, both of which point to equity, there is no doubt that neither party had a right to a jury in this case. In summary, this court holds that a defendant, asserting only affirmative defenses and no counterclaims, does not have a right to a jury trial in a patent infringement suit if the only remedy sought by the plaintiff-patentee is an injunction.

TEA's assertions that the district court violated Federal Rules of Civil Procedure 38(d) and 39(a) are procedural challenges to the district court's decision that there were no issues entitled to be tried before a jury. These challenges are reviewed under the precedent of the pertinent regional circuit, the Fourth Circuit in this case. *Wexell v. Komar Indus., Inc.*, 18 F.3d 916, 919, 29 USPQ2d 2017, 2019 (Fed. Cir. 1994) ("This court applies the law of the pertinent regional circuit when the precise issue to be addressed involves an interpretation of the Federal Rules of Civil Procedure."). Under Fourth Circuit law, TEA's assertions are wholly without merit. Rule 39(a) specifically directs the court not to use a jury, even when a jury has been requested, if "the court . . . finds that a right of trial by jury . . . does not exist." Fed. R. Civ. P. 39(a). This is exactly what the district court did. *Francis v. Dietrick*, 682 F.2d 485, 486-87 (4th Cir. 1982) (holding that Rule 39a was not violated by a district court's decision to allow the plaintiff to amend his complaint to withdraw his request for damages, and its ruling that there were no remaining issues entitled to be tried before a jury). Rule 38(d) applies to the withdrawal by a party of its demand for a jury, and is thus inapplicable. Fed. R. Civ. P. 38(d) ("A demand for trial by jury made as herein provided may not be withdrawn without the consent of the parties."); *Francis*, 682 F.2d at 486-87 (finding no violation of Rule 38, as well as Rule 39). Accordingly, the district court's decision to conduct a bench trial did not violate either Rule 38(d) or Rule 39(a).

C. Construction of "Electrode"

Claim construction is a matter of law and is reviewed de novo on appeal. *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1456, 46 USPQ2d 1169, 1174 (Fed. Cir. 1998) (en banc).

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1.

During the district court proceedings, the parties vigorously disputed the proper construction of the claim term "electrode." The district court construed this term in its *Markman* hearing approximately four months before trial, as "any conductive surface, including a metal chamber wall or other surface, coupled to the plasma." *Opinion*, slip op. at 6 (quoting the *Markman* order). The district court then defined "coupled" to mean "[e]lectrically connected or connected by a conductive path, capacitively, inductively, or by any other means of transferring energy." *Id.* at 6 (quoting the *Markman* order).

TEA argues that an "electrode" must participate in generating the electrical field that forms the plasma, and not merely be coupled to the plasma. TEA also asserts that Tegal made, and relied upon, such a distinction in the prosecution history to secure allowance of the '223 patent. TEA further argues that the district court improperly relied on extrinsic evidence in construing "electrode."

Tegal defends the district court's construction. Tegal also asserts that "coupling to the plasma" and "generating the electric field" have the same general result that the electrodes "act together to create AC electric fields that charge the gas." Tegal argues, however, that characterizing an electrode as being coupled to the plasma is "more faithful to the specification and the claim language."

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2.

We need not address each of the parties' claim construction arguments directly. Rather, we construe the term "electrode" according to the normal rules of claim construction.

> First, we look to the claim language. Then we look to the rest of the intrinsic evidence, beginning with the specification and concluding with the prosecution history, if in evidence.
>
> If the claim language is clear on its face, then our consideration of the rest of the intrinsic evidence is restricted to determining if a deviation from the clear language of the claims is specified. . . .
>
> . . . .
>
> . . . Relying on extrinsic evidence to construe a claim is proper only when the claim language remains genuinely ambiguous after consideration of the intrinsic evidence. . . .
>
> . . . But extrinsic evidence may never be used for the purpose of varying or contradicting the terms in the claims.
>
> Throughout the construction process, it is important to bear in mind that the viewing glass through which the claims are construed is that of a person skilled in the art.

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Interactive Gift Express, Inc. v. Compuserve Inc., 231 F.3d 859, 865-66, 56 USPQ2d 1647, 1652-53 (Fed. Cir. 2000) (citations and internal quotations omitted).

Looking first to the claims, we observe that the term "electrode" is used throughout the claims, particularly claims 1 and 7, and is used in a broad sense. It is also clear that "electrode" is a term of art susceptible to various meanings, and so we go to the specification, as indeed the parties direct us, to determine the scope of this term.

The specification also supports a broad construction, focusing primarily on the fact that electrodes are coupled to an electric potential or source. The specification introduces the term "electrode" in the summary section by merely describing the electric potential or the electrical, or electromagnetic, source to which a given electrode is "coupled."[6] '223 patent, col. 1, ll. 50-55 ("One of the electrodes is held at ground while the second is selectively coupled to a high frequency AC source and the third is selectively coupled to a low frequency AC source."). The specification then states that electric fields are established between the electrodes. *Id.* at col. 1, ll. 55-57.

A subsequent section of the specification, entitled Detailed Description of Preferred Embodiments, continues this focus on electric potential or source by noting that the electrodes must have "electrical isolation" between them. *Id.* at col. 2, l. 39. That section goes on to describe the electrodes

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6. Regarding the term "coupled," we note that the parties do not dispute the district court's construction, and we accept it.

of the preferred embodiment in terms of the electric potential or source to which they are coupled. *Id.* at col. 2, ll. 58-66 (stating that "a high frequency power supply 30 and a low frequency power supply 36 are coupled to the second and third electrodes" and "the top electrode 10 is coupled to ground"). The specification, therefore, broadly describes an "electrode," and imposes no limitations beyond its having an electric potential or source coupled to it, and the implicit requirement that it be a conductive surface so that electric fields can be established between electrodes.

Examining the prosecution history, we note that Tegal distinguished over the prior art by asserting that the '223 invention produced a single discharge among three electrodes. Tegal asserted, for example, that "[t]here is nothing in [the cited prior art references] which would lead one of ordinary skill in the art to connect the AC sources to produce a single discharge[, that is, plasma,] from three electrodes." (Emphasis omitted). Accordingly, the word "electrode" must be read to reflect this position. However, the parties disagree as to how best to characterize this position. In essence, they debate whether "produc[ing]" the plasma "from three electrodes" requires that the three electrodes actually generate the plasma.

We conclude that the prosecution history is more accurately described as requiring the electrodes to be "coupled to the plasma," and not, as argued by TEA, as requiring the electrodes to generate the plasma. The inaccuracy of TEA's characterization is revealed by the specification, which instructs us that a plasma is "generated by the high and/or low frequency electric fields established

between the electrodes." '223 patent, col. 1, ll. 55-57. Thus, the electric fields, and not the electrodes, generate the plasma. However, it is undisputed that the electrodes will be coupled to the plasma due to the presence of ions, and a current, in the plasma.

In the prosecution history, Tegal also distinguished over the Cotton reference by stating that "the electrodes claimed in the present invention are not the same as those disclosed in Cotton," which Tegal described as being spiked electrodes. Accordingly, the term "electrode" must be construed so as not to cover a spiked electrode.

In sum, we construe an electrode as any conductive surface, including a metal chamber wall or other surface except a spike, coupled to the plasma, and having an electric potential or source coupled to it. Further, because claim 1 recites it, at least one of the electrodes must be "adapted for holding a workpiece." '223 Reexam. Cert., col. 1, ll. 36-37. Because the phrase "having an electric potential or source coupled to it" is duplicative of other limitations in the asserted claims, our construction diverges from the district court's only in explicitly excluding a spiked electrode.

D. Construction of "Plasma"

1.

The district court did not explicitly construe the now-disputed claim limitation of "plasma." However, the district court's opinion did provide the following working definition of the term "plasma" in its discussion of the technology of the '223 patent:

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> Plasma is a charged collection of particles. It has no shape or form. Although the density of the plasma can vary in different locations, the plasma reaction occurs throughout the chamber. During the ionization process, charged particles are created that strike all of the surfaces on the interior of the chamber.

Opinion, slip op. at 2-3 (citations to the record omitted).

TEA asserts that the district court improperly relied on extrinsic evidence in "construing" the term plasma and that the intrinsic evidence, particularly the prosecution history, "unambiguously defines 'plasma' to mean a 'glow discharge.' " TEA maintains that a glow discharge is a particular type of plasma characterized by having a current within a specific range, and argues that Tegal relied on this distinction in the prosecution history of the '223 patent to obtain allowance.

Tegal responds that the district court never construed the term "plasma" because TEA failed to identify it as a disputed term, and that TEA has therefore waived any argument concerning the meaning of this term. Tegal states that TEA failed to identify "plasma" as a disputed term in its *Markman* brief, its Rule 26 Expert's report, its expert's deposition, any pre-trial filing or trial brief, or its opening statement at trial. Tegal alleges that TEA first raised the issue during trial and then again in post-trial briefing. Tegal also responds that the intrinsic evidence supports a broad construction of "plasma" and that TEA improperly resorts to extrinsic evidence for its narrower definition of glow discharge.

2.

Although it is unclear why the parties did not identify the term "plasma" as a disputed claim limitation before trial, it is not disputed that they did so at trial. If Tegal thinks that TEA waited too late, Tegal should have prevailed upon the district court to exclude TEA's evidence of what "plasma" meant. The term having been brought into dispute at trial, and the district court having addressed the term in its opinion, albeit informally, we do not consider the issue to have been waived. *Cf. Sage Prods., Inc. v. Devon Indus., Inc.*, 126 F.3d 1420, 1426, 44 USPQ2d 1103, 1108 (Fed. Cir. 1997) ("With a few notable exceptions, . . . appellate courts do not consider a party's new theories, lodged first on appeal. If a litigant seeks to show error in a trial court's overlooking an argument, it must first present that argument to the trial court.").

As with "electrode" above, we need not address each of the parties' claim construction arguments directly, but proceed to construe the term "plasma" according to the normal rules of claim construction. Looking to the claims, we note that the term "plasma" occurs only in claim preambles. '223 Reexam. Cert., col. 1, l. 28 (claim 1), col. 1, l. 43 (claim 2), col. 2, l. 8 (claim 6), col. 2, l. 19 (claim 7). Preambles are not necessarily limiting. *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951) (stating that a preamble is limiting when it is "necessary to give life, meaning and vitality to the claims or counts"). However, the parties do not dispute that "plasma" is a limiting term in the claims at issue and, at least for the reason that we have construed "electrode" in terms of "plasma," we agree. The term "plasma" is not limited to any narrow definition

by its use in the claims. It is also clear that "plasma" is a term of art susceptible to various meanings, so we go to the specification, as indeed the parties direct us, to determine the scope of this term.

The specification also supports a broad construction of "plasma," in which the "plasma" need only contain ions and be generated by electric fields. As explained earlier, the specification states that the plasma is "generated by the high and/or low frequency electric fields established between the electrodes." '223 patent, col. 1, ll. 55-57. The specification also emphasizes the need to control both the density and the energy of the ions in the plasma, thus focusing on the fact that the plasma must contain ions. *Id.* at col. 1, l. 39, col. 2, ll. 15-24, col. 3, ll. 37-42. Beyond the obvious requirement that there be ions in the plasma, to perform the ion bombardment, the specification does not impose further requirements and uses the term "plasma" in a broad sense. The various examples illustrate that the plasma can be created from a variety of gases and used at a variety of operational settings (power, duration of exposure, frequencies, pressures). *Id.* at cols. 4-5. Further, there is no indication in the specification that the claimed invention is to be restricted even to these illustrated ranges.

The prosecution history primarily reinforces the specification's broad use of the term "plasma." TEA first argues that Tegal equated "plasma" with a "glow discharge." We agree. Tegal used the terms "discharge" and "plasma" interchangeably, or even together as in "plasma discharge," in referring to the prior art references and the claimed invention. For example, Tegal refers to: (1) the claimed

invention's plasma as a discharge; (2) the Cotton reference as disclosing either a discharge or a plasma; and (3) the Chapman reference as disclosing either a discharge or a plasma. Tegal also equated the claimed "plasma" with a "glow discharge," stating that a "plasma in accordance with the present invention is a glow discharge," and that the claimed "invention relates to apparatus for processing semiconductor wafers in a plasma glow discharge."

TEA's second argument, however, is that Tegal's use of the term "glow discharge" is limiting and is defined by its current. We disagree. TEA relies on a figure from a physics book, published approximately ten years after the '223 patent issued. The figure shows that a "glow discharge" is differentiated from other discharges by the amount of current flowing through the discharge. In order of ascending current flow, ranging from approximately 10^{-10} amps to 10 amps, the figure depicts a Townsend discharge, a glow discharge, an "abnormal glow discharge," and an arc discharge. TEA's reliance on this figure is misplaced. Neither the claims, the specification, nor the prosecution history even suggest that the claimed plasma is limited to the particular range of current TEA proposes, and TEA's use of extrinsic evidence to establish such a contrary proposition is improper. *Interactive Gift Express*, 231 F.3d at 866, 56 USPQ2d at 1652-53.

Although Tegal did not restrict the claimed "plasma" to the current range proffered by TEA, Tegal did distinguish the claimed "plasma" from the discharge of the Cotton reference. Tegal's statement, quoted above, that "[a] plasma in accordance with the present invention is a glow discharge," was followed by the statement that "Cotton, on the other

hand, is concerned primarily with an arc discharge." Tegal also characterized the Cotton discharge as a spike discharge, emanating from a spiked electrode at frequencies up to 300 GHz. Accordingly, "plasma" must be construed so as not to cover a spike or arc discharge emanating from a spiked electrode.

In sum, we construe "plasma" as a charged collection of particles, generated by the high and/or low frequency electric fields established between the electrodes, excluding arc or spike discharges such as would emanate from a spiked electrode.

The parties also dispute the proper construction of the claim term "glow discharge." This term is recited only in claim 7, in a context similar to that in claim 1. '223 Reexam. Cert., col. 2, ll. 20, 42. It does not appear in the specification. However, as explained above, the prosecution history indicates that "glow discharge" is intended as a substitute for "plasma." Because one of skill in the art would understand from the prosecution history that the term "glow discharge" is intended to be coextensive with the term "plasma," we construe it accordingly.

E. Anticipation

What a prior art reference discloses in an anticipation analysis is a factual determination that we review under the clearly erroneous standard. *In re Graves*, 69 F.3d 1147, 1151, 36 USPQ2d 1697, 1700 (Fed. Cir. 1995).

The district court found that the Itakura reference did not anticipate claims 1 and 7, under 35 U.S.C. § 102(b),

because "Itakura does not contain each and every element in the contested claims of the '223 [Reexamination Certificate]." *Opinion*, slip op. at 15. The district court's analysis consists of three substantive sentences, repeated below:

> [Itakura] does not disclose three electrodes; rather, Dr. Sawin testified that a third electrode is "implicit" in Itakura, but he pointed to no teaching in the patent to support his claim. Itakura actually discloses two plasmas separated by a metal grid with very small holes. In addition, there is no single "plasma" or single "reaction volume," and there is nothing to indicate that it has a "workpiece located within the reaction volume" that claim 7 specifically requires.

Id. at 15.

In this analysis, the district court thus found that Itakura did not disclose a third electrode, a single plasma, a single reaction volume, or a workpiece being located in each reaction volume. Tegal argues a slight variation, asserting that Itakura discloses a single plasma but that it does not fill the entire chamber. Tegal further argues that Itakura does not disclose three electrodes at different potentials with one of the potentials being ground. As we explain below, we hold that each of the district court's findings with regard to Itakura are clearly erroneous, but we cannot reverse the finding of no anticipation because the district court made no findings with regard to the two frequency limitations of claims 1 and 7. Accordingly, we must remand for that determination.

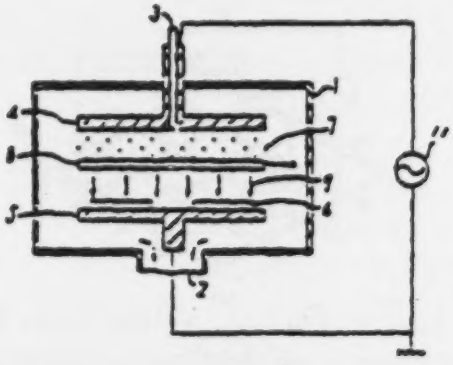
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In the remainder of this section we address the following points, considering Tegal's arguments where appropriate: (1) the district court's findings regarding Itakura's disclosure of electrodes; (2) the district court's remaining findings; and (3) the remaining limitations of claims 1 and 7.

1.

The district court found that Itakura did not disclose three electrodes, as required by both claims 1 and 7. *Id.* at 15. However, Itakura states that reference numerals 4, 5, and 8, of Figure 2 (reproduced below), are each electrodes; it discusses them as electrodes; and it claims them as electrodes.

Figure 2

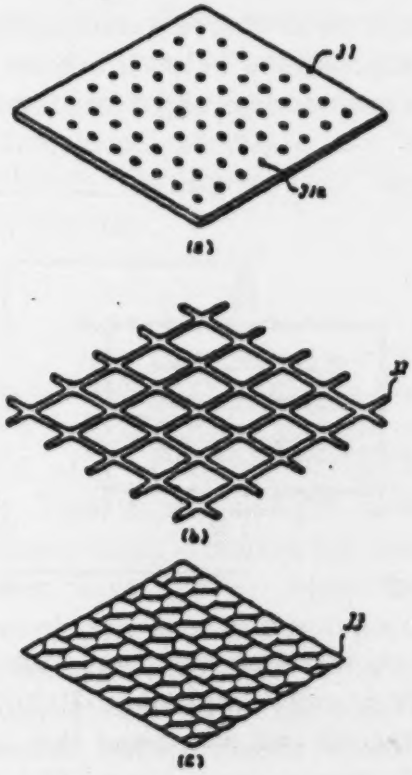


The district court relied on testimony from Dr. Sawin that a third electrode is only implicit in Itakura. *Id.* We have searched the record and not found this testimony; Tegal carefully avoids pointing us to it; and TEA explains that not only is there no such testimony but that Dr. Sawin testified to the contrary, saying that there are indeed three electrodes.

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More importantly, Itakura's "third electrode" meets the requirements of our construction of the term "electrode." The district court refers to Itakura's third electrode, reference numeral 8, as a "metal grid," not regarding it as an "electrode." Itakura, however, refers to the structure identified by reference numeral 8 as "a third electrode (8) having many small holes," and provides a variety of shapes as indicated in Figure 3, reproduced below.

Figure 3

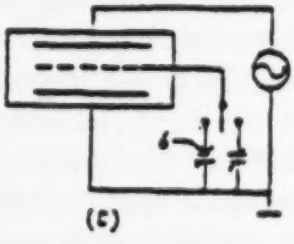


Appendix A

Itakura provides the following explanation of Figure 3: "[T]he shape of the third electrode, as shown in Figure 3, is composed of an electroconductive material plate (31) (Figure 3(a)), an electroconductive material lattice (32) (Figure 3(b)), or an electroconductive material net (33) (Figure 3(c)) . . . ." Clearly, Itakura's "third electrode" has a conductive surface.

Itakura also discloses that the third electrode can be connected to an electric potential or source, stating that "a positive or negative direct-current voltage or a low-frequency alternating-current voltage is applied to the third electrode with respect to the second electrode." One of these embodiments is illustrated in Figure 4(c) from Itakura, reproduced below.

Figure 4



The "third electrode" of Itakura is thus described as comprising a conductive surface that is not a spike, and that has an electric potential or source coupled to it. Further, Figure 2 shows that at least the electrode of reference numeral 5 is "adapted for holding a workpiece." There is no dispute that the "third electrode" will also be coupled to the plasma. Accordingly, Itakura's "third electrode" meets the limitations of the claimed electrode in the '223 patent. The district court's finding to the contrary is clearly erroneous.

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2.

The district court implicitly construed claim 7 to require a single plasma and a single reaction volume, and found that Itakura did not disclose these. The district court appears to have concluded that Itakura discloses two separate plasmas and two separate reaction volumes. Tegal agrees that there are two reaction volumes, but argues that Itakura only discloses a single plasma that fills only one of the volumes.

The arguments of both the district court and Tegal assume that the plasma and its ions cannot pass through Itakura's "third electrode" and, thus, two volumes are formed with at least one of them having a confined plasma. An examination of Itakura, however, shows that this assumption is clearly erroneous. Itakura's Figure 3, reproduced above, particularly the lattice of Figure 3(b), shows that the "third electrode" can be an extremely porous barrier. Itakura also states, in describing Figure 3, "that the passage of the reaction component [through the third electrode] is smooth." This statement clarifies that the "third electrode" does not prevent the plasma from passing through it. Additionally, it follows logically that the plasma ions must pass through the "third electrode" in order to etch the workpiece at all.

The claims require a reaction volume containing a plasma, and our construction requires that all three electrodes couple to that plasma. Itakura discloses these requirements and the district court's findings to the contrary are clearly erroneous. We also note that Itakura's reaction volume contains, as required by the asserted claims, a workpiece.

3.

TEA maintains that Itakura anticipates claims 1 and 7 of the '223 Reexamination Certificate. Accordingly, we address the remaining contested limitations of claims 1 and 7.

Tegal's argument that Itakura does not disclose three electrodes at different potentials, with one electrode being coupled to ground, is meritless. Itakura's Figure 4(c), reproduced above, clearly sets forth such a configuration, with the top electrode being coupled to an AC source, the middle electrode being coupled to either a positive or negative direct-current source, and the bottom electrode being coupled to ground. More importantly, Itakura suggests modifying Figure 4(c) by "applying low-frequency alternating-current voltage to the second [electrode] or third [electrode]." Thus, Itakura not only discloses three different potentials, but these potentials include a high-frequency AC source, a low-frequency AC source, and ground, as required by the asserted claims.

Although we have reversed each of the district court's findings and have rejected all of Tegal's arguments, we cannot reverse the finding of no anticipation because the district court made no findings regarding the frequency limitations. Claim 1 recites a "low frequency" and a "high frequency," and claim 7 recites "1 MHz" and "10 MHz." '223 Reexam. Cert., col. 1, ll. 32-35 (claim 1), col. 2, ll. 41-42 (claim 7). These limitations were in issue and the district court expressly construed the claim 1 limitations. The district court construed "low frequency" as any frequency less than about 1 MHz and construed "high frequency" as any frequency greater than

about 10 MHz. The parties do not dispute these constructions and we accept them. However, the district court never made any findings regarding whether Itakura disclosed the claimed high and low frequencies. We must remand, therefore, for further findings. On remand, the district court may address whether Itakura, or another reference, discloses the claimed frequencies and whether claims 1 and 7 are rendered invalid by Itakura, either alone or in combination with another reference.

F. Obviousness

"The ultimate determination of whether an invention would have been obvious is a legal conclusion based on the totality of the evidence, including underlying factual inquiries . . . . Accordingly, this ultimate determination of obviousness is reviewed without deference, while any factual findings are reviewed for clear error." *Brown & Williamson*, 229 F.3d at 1124, 56 USPQ2d at 1459 (citations omitted).

The district court determined that the '223 patent was not invalid under 35 U.S.C. § 103(a) as being obvious over the NTT reference. The district court based this legal conclusion, in part, on the finding that the "NTT reference does not disclose a chamber wall." *Opinion*, slip op. at 16. Implicit in this finding is a finding that the NTT reference does not disclose a metal wall. The district court's determination was also based on its finding that "it would not have been obvious to one of ordinary skill in the art in 1983 to convert the NTT etcher into a triode configuration with a metal wall serving as a third electrode." *Id.* The district court also found that the secondary indicators of

non-obviousness favored Tegal, thus supporting the conclusion of non-obviousness. *Id.* at 17. TEA appeals, arguing in part that those skilled in the art would recognize, first, that the apparatus disclosed in the NTT reference had a chamber wall and that it could be glass or metal and, second, that metal chamber walls were usually grounded.

We note that the NTT reference states that "[t]he apparatus inside is exhausted by a vacuum pump." Creating a vacuum requires a closed structure, so NTT implicitly discloses a chamber wall. However, the NTT reference never discusses the chamber wall and contains no suggestion that the wall should or could be conductive. Accordingly, the district court's implicit finding, that the NTT reference does not disclose a metal wall, is not clearly erroneous.

This finding does not preclude a conclusion that the asserted claims would have been obvious. Arguing for such a conclusion, TEA identifies testimony from the trial asserting that there were two "obvious" choices for the chamber wall, either glass or metal, and that the "trend" was to use metal, which would usually be grounded for safety purposes. We deal here with a presumption of validity, which can only be overcome by clear and convincing evidence. The testimony identified by TEA is insufficient to convince us that the district court erred in holding that it would not have been obvious to one of ordinary skill to use a grounded metal chamber with the NTT etcher.

G. Inequitable Conduct

"The ultimate question whether there was inequitable conduct is committed to the discretion of the trial court and

we review the court's determination . . . for abuse of discretion. We will not disturb that determination absent a showing that it was based upon erroneous finding of fact, a misapplication or misinterpretation of applicable law, or evidences a clear error of judgment." *Gen. Electro Music Corp. v. Samick Music Corp.*, 19 F.3d 1405, 1408, 30 USPQ2d 1149, 1151 (Fed. Cir. 1994).

The district court determined that Tegal had not engaged in inequitable conduct by failing to disclose the NTT reference to the United States Patent and Trademark Office ("PTO") during the '223 reexamination, even though that reference was cited against a Japanese counterpart to the '223 patent. *Id.* at 13. The court found that TEA had failed to meet its burden, which was clear and convincing evidence, on both the intent prong and the materiality prong of the inequitable conduct test. *Id.* at 10-14; *Kingsdown Med. Consultants, Ltd. v. Hollister, Inc.*, 863 F.2d 867, 872, 9 USPQ2d 1384, 1389 (Fed. Cir. 1988) (en banc) ("Inequitable conduct resides in failure to disclose material information . . . with an intent to deceive . . . ."). With regard to the materiality prong, the court's opinion reveals that TEA failed to meet its burden because it failed to overcome the evidence that the NTT etcher was a diode etcher and, therefore, cumulative art.

TEA asserts error in the district court's materiality finding and presents two arguments in support thereof. TEA's first argument alleges that a Japanese counterpart to the '223 patent was issued only after amending the claims to avoid the NTT reference, allegedly surrendering in the process most of the subject matter covered by the U.S. claims. We do not find this argument persuasive. We note that the Japanese

office action, to which TEA directs us, concerns two pieces of prior art. TEA fails to explain why the amendments were not necessitated by the second piece of prior art, and also fails to address the differences between U.S. and Japanese patent law which may have required an amendment for patentability in Japan but not in the United States.

TEA's second argument alleges that "Tegal distinguished prior art by telling the PTO that no reference applied two separate frequencies to two different electrodes," but TEA asserts that Figure 3 of the NTT reference shows this feature. Having reviewed the prosecution history that TEA cites, we note that TEA overstates the case because Tegal distinguished only a single reference with this argument. Regardless, TEA's argument assumes that which it seeks to prove — that the NTT reference is not cumulative. In its reply brief, TEA addresses this weakness directly, asserting that the NTT reference is the only reference disclosing this feature. We acknowledge that whether the NTT reference is cumulative is a debatable factual question. However, after reviewing the evidence of record, we discern no reversible error in the district court's finding that NTT had not satisfied its burden of proving materiality.

Having failed to prove materiality, TEA cannot prevail on its appeal of the inequitable conduct issue.

H. Infringement

Literal infringement is a question of fact that we review under the clearly erroneous standard. *Biovail Corp. Int'l v. Andrx Pharms., Inc.*, 239 F.3d 1297, 1300, 57 USPQ2d 1813, 1815 (Fed. Cir. 2001).

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The district court found that TEA's IEM etchers, models 65DI and 85DI, infringed[7] claims 1 and 7 of the '223 Reexamination Certificate. *Opinion*, slip op. at 6. Central to this conclusion was the finding that the grounded chamber walls of the accused devices "are electrically coupled to the plasma." *Id.* at 7. The court explained that "[a]lthough the density of the plasma may vary inside the chamber, it is able to expand throughout and is thus not confined solely to the area between the upper and lower electrodes." *Id.* The court explicitly found that the current in the plasma extends to the wall. *Id.* TEA challenges this finding on appeal, asserting that the accused devices "confine" the plasma between the top and bottom electrodes and, thus, do not infringe. TEA is essentially arguing that the plasma does not extend to, and therefore is not coupled to, the grounded chamber wall. Tegal responds by pointing to the evidence of etching and sputtering on the grounded chamber wall of the accused devices, which indicates that the wall is coupled to the plasma.

We have construed "plasma" to require "a charged collection of particles," and "electrode" to require a "conductive surface . . . coupled to the plasma, and having an electric potential or source coupled to it." The dispute over infringement revolves, then, around whether charged particles are coupled to the grounded chamber wall. Given the evidence that the grounded chamber wall was being etched, we cannot say that the district court's finding of infringement was clearly erroneous.

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7. Although neither the district court nor the parties specify whether the infringement was literal or by equivalents, it is clear from the arguments of the district court that it was literal.

Appendix A

I. Willfulness, Exceptional Case, Attorney Fees

"A court's determination that infringement was willful is a finding of fact, reviewable under the clearly erroneous standard." *Graco, Inc. v. Binks Mfg. Co.*, 60 F.3d 785, 792, 35 USPQ2d 1255, 1260 (Fed. Cir. 1995). At trial, willfulness must be proven by clear and convincing evidence. *Embrex, Inc. v. Serv. Eng'g Corp.*, 216 F.3d 1343, 1350, 55 USPQ2d 1161, 1164 (Fed. Cir. 2000). "The determination of whether a case is exceptional and, thus, eligible for an award of attorney fees under § 285 is . . . a factual determination reviewed for clear error." *Cybor*, 138 F.3d at 1460, 46 USPQ2d at 1178 (citation omitted). The subsequent determination of whether attorney fees are appropriate is reviewed for an abuse of discretion. *Id.*

The district court found that TEA's infringement was willful both before and after Tegal's filing of the infringement suit. *Opinion*, slip op. at 9-10. Based exclusively on the willfulness findings, the district court determined that this case was exceptional and then awarded attorney fees to Tegal under 35 U.S.C. § 285. Because there were no damages, the district court's willfulness findings were only relevant to the court's § 285 determination. Section 285 provides that attorney fees can only be awarded to the prevailing party. Because we have vacated the determination that the '223 patent was not anticipated, there is no prevailing party as of yet. As a result, any analysis of exceptional case status or attorney fees under § 285 is premature. *DH Tech., Inc. v. Synergystex Int'l, Inc.*, 154 F.3d 1333, 1334, 47 USPQ2d 1865, 1866 (Fed. Cir. 1998) ("We also vacate the district court's denial of exceptional case status and attorney's fees

because the prevailing party . . . has yet to be determined."). Accordingly, we vacate the finding that this was an exceptional case and the award of attorney fees, as well as the subsidiary findings of willfulness, and remand for further proceedings consistent with this opinion. The district court can address these issues anew after it revisits the validity determination.

J. Injunction

"[D]istrict courts are . . . given broad discretion under 35 U.S.C. § 283 . . . to determine whether the facts of a case warrant the grant of an injunction and to determine the scope of the injunction. Accordingly, we review a district court's decision to grant an injunction and the scope of that injunction for abuse of discretion." *Joy Techs., Inc. v. Flakt, Inc.*, 6 F.3d 770, 772, 28 USPQ2d 1378, 1380 (Fed. Cir. 1993) (citations and footnotes omitted); *see Ortho Pharm. Corp. v. Smith*, 959 F.2d 936, 945, 22 USPQ2d 1119, 1127 (Fed. Cir. 1992) (annunciating same standard).

After determining that the '223 patent was valid and infringed, the district court awarded Tegal an injunction. TEA challenges the breadth of the injunction, asserting that it fails to satisfy the requirements for particularity in Rule 65(d) of the Federal Rules of Civil Procedure and that it runs afoul of the marking statute.

We do not reach these issues. Injunctions may be granted to "prevent the violation of any right secured by patent." 35 U.S.C. § 283. In light of our decision to vacate and remand the determination that the '223 patent is not invalid, the right

secured by the '223 patent remains under challenge and uncertain. Therefore, we vacate the injunction.

CONCLUSION

We affirm the district court's decision that neither party had a right to a jury trial, and that claims 1 and 7 of the reexamined '223 patent are enforceable, not obvious over the NTT reference, and were infringed. We vacate, however, the finding that Itakura does not anticipate claims 1 and 7. We also vacate the findings of pre-filing and post-filing willfulness, the finding of an exceptional case, the award of attorney fees, and the injunction. We remand for proceedings consistent with this opinion.

AFFIRMED-IN-PART, REVERSED-IN-PART, VACATED-IN-PART AND REMANDED

Appendix A

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

00-1009

TEGAL CORPORATION,

Plaintiff-Appellee,

v.

TOKYO ELECTRON AMERICA, INC.,

Defendant-Appellant.

00-1209

TEGAL CORPORATION,

Plaintiff-Appellee,

v.

TOKYO ELECTRON AMERICA, INC.,

Defendant-Appellant.

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00-1307

TEGAL CORPORATION,

Plaintiff-Appellee,

v.

TOKYO ELECTRON AMERICA, INC.,

Defendant-Appellant.

JUDGMENT

ON APPEAL from the United States District Court for the Eastern District of Virginia

In CASE NO(S). 99-CV-737; 98-CV-318

This CAUSE having been heard and considered, it is

ORDERED and ADJUDGED:

AFFIRM-IN-PART, REVERSE-IN-PART, VACATE-IN-PART AND REMAND

ENTERED BY ORDER OF THE COURT

DATED JUL 16 2001

s/ Jan Horbaly
Jan Horbaly, Clerk

ISSUED AS A MANDATE (as to 00-1009 only):
SEPTEMBER 13, 2001

APPENDIX B — FINDINGS OF FACT AND CONCLUSIONS OF LAW AND JUDGMENT OF THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF VIRGINIA, RICHMOND DIVISION, DATED AND FILED AUGUST 31, 1999

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF VIRGINIA
RICHMOND DIVISION

Civil Action Number 3:98CV318

TEGAL CORPORATION

Plaintiff,

v.

TOKYO ELECTRON AMERICA, INC.

Defendant.

FINDINGS OF FACT AND CONCLUSIONS OF LAW

After a three-day non jury trial, occurring on May 26-28, 1999, this Court having heard evidence and argument, hereby makes the following findings of fact and conclusions of law:

I. BACKGROUND

A. The Parties

On March 17, 1998, Tegal Corporation (Tegal), a Delaware corporation with its principal place of business in

Petaluma, California, brought this patent infringement action against Tokyo Electron America, Inc. (TEA). TEA is a California corporation with its principal place of business in Austin, Texas. There are two patents at issue in this suit, United States Patent No. 4,464,223, as amended by Reexamination Certificate B1 4,464,223 (collectively, the '223 Patent) and United States Patent No. 4,585,920 (the '920 Patent). The '223 Patent and the '920 Patent are both owned by Motorola Corporation, but Tegal holds the exclusive license to enforce them and as such, is the de facto owner of each patent. Tr. 98:8-100:18; 103:2-105:4.

Tegal manufactures and sells plasma etching equipment. It had initial commercial success in the late 1970s and early 1980s with the introduction of the first single-wafer plasma etch system. Tr. 82:18-84:17. This significant invention was responsible for a number of product features and other innovations that have since become industry standard. Tr. 84:9-86:14.

TEA is a wholly-owned subsidiary of Tokyo Electron Ltd. (TEL), a Japanese corporation. TEL manufactures and sells in the United States a variety of semiconductor manufacturing equipment, which includes plasma etching systems. TEA provides the sales support, training and customer service for TEL's plasma etching systems. Tr. 336:7-10.

B. The Technology

Both the '223 and '920 Patents are directed to what is known in the semiconductor fabrication industry as plasma

processing technology. Order of January 21, 1999 (Markman Order) at 2. In a plasma processing reactor, sometimes called an "etcher," gas is injected into a low-pressure sealed chamber where it reacts with an electric field established between electrodes to create a plasma. *Id.* Within the plasma, two primary reactions occur. First, electrons collide with gas molecules with sufficient force to knock an electron away from those molecules, thereby generating positively charged ions. *Id.* Second, some electrons actually break apart gas molecules into their constituent atoms. This is called dissociation. *Id.* The ions are induced to strike a wafer surface, or "workpiece," situated within the chamber with sufficient force to strip material away from the workpiece. *Id.* at 2-3. By controlling the ion behavior, extremely precise patterns can be created. *Id.* at 3.

Plasma is a charged collection of particles. Tr. 176:3-7. It has no shape or form. Tr. 176:8-9. Although the density of the plasma can vary in different locations, the plasma reaction occurs throughout the chamber. Tr. 178:20-23; 182:2-15. During the ionization process, charged particles are created that strike all of the surfaces on the interior of the chamber. Tr. 178:13-179:24. Ion bombardment takes place along the boundary of the plasma and the chamber walls, otherwise known as the sheath region. Tr. 177:15-178:19. This occurs when ions are accelerated across the sheath and hit the surface of the chamber. Tr. 178:13-19. The higher the electrical potential of the sheath region, the higher the energy of the ions striking the surface of the chamber. As ions travel in random directions near the sheath region, they become energized and accelerate vertically across the sheath. *Id.* This imparts "directionality" to the etching process, known as

anisotropic etching, which allows for better control over the patterns that are replicated into the surface of the wafer. Tr. 91:14-92:5.

Prior to the invention of the '223 Patent, plasma processing reactors typically used a two electrode, or "diode," configuration. Markman Order at 3. While the diode reactor was a dramatic improvement over earlier "wet etching" technology, it lacked flexibility in that one could not reduce the energy with which the ions strike the workpiece without also reducing the ion density in the plasma. *Id.* There are two basic ways to de-couple ion density in the plasma. First, one can use a three electrode, or "triode," configuration. *Id.* Second, one can connect the electrodes to different RF frequencies, one high and one low. *Id.* Both of these approaches were known and had been tried prior to the '223 Patent. *Id.* The '223 Patent, however, represented an advance in that it combined the use of dual frequencies with a triode configuration. *Id.*

II. THE '223 PATENT

A. Standard for Infringement

"It is well settled that each element of a claim is material and essential," and that, in order to prevail on a claim of infringement, the plaintiff "must show the presence of every element or its substantial equivalent in the accused device." *London v. Carson Pirie Scott & Co.*, 946 F.2d 1534, 1538 (Fed. Cir. 1991).

Appendix B

B. Analysis

Tegal contends that all IEM etching systems sold or offered for sale by TEA in the United States infringe literally claims 1 and 7 of the '223 Patent. This includes all "Unity System" model DI oxide etchers, in both 6 inch (65DI) and 8 inch (85DI) configurations. Tegal also asserts infringement by the Advanced IEM polysilicon etcher, model IIs84DI. These machines are all "dual frequency" etchers. According to specifications for the 65DI and 85DI machines, they operate at 27.12 MHz and 800 Khz. Pl.s Ex. 40 at TOK035070. A schematic diagram of the IIs84DI reveals that the "Advanced IEM" is designed to operate at 60 MHZ and 13 MHZ. Pl.'s Ex. 113 at TOK063875.

Claims 1 and 7 of the '223 Patent, respectively, read as follows:

> *Claim 1*: A reactor apparatus including a reaction volume into which reactants are injected and from which reaction products are exhausted, and in which said reactants are acted upon by electric fields to form a plasma thereof, said apparatus comprising:
>
> [a] first, second, and third electrodes,
>
> [b] said first electrode coupled to electrical ground,
>
> [c] said second electrode selectively coupled to a high frequency source of AC power,

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[d] said third electrode selectively coupled to a low frequency source of AC power, and wherein one of said electrodes is adapted for holding a workpiece.

Claim 7: A plasma reactor for treating a workpiece in a glow discharge comprising:

[a] first, second, and third electrodes separated by insulators for defining a reaction volume in which said workpiece is located;

[b] means for admitting reactants to said reaction volume and for removing

[c] reaction products from said reaction volume;

[d] a first high frequency AC power supply coupled between said first electrode and said second electrode;

[e] a second low frequency AC power supply coupled between said first electrode and said third electrode;

[f] an electrical ground coupled to said first electrode;

[g] said first and second power supplies producing different frequencies respectively above about 10 MHZ and below about 1 MHZ for causing a glow discharge in said volume.

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The parties agree that there is no material difference between the two claims. Unlike claim 1, claim 7 explicitly requires that each of the electrodes be separated by insulators. However, as noted in the Court's Markman Order, this naturally follows from the fact that, as the language of claim 1 makes clear, each electrode must be at a different electrical potential — i.e., ground, high frequency, and low frequency. Markman Order at 4. Were there no insulation separating the electrodes, they would not be at different electrical potentials, and therefore could not be considered separate electrodes. *Id.*

After the Markman Hearing, this Court construed the claim language "first electrode coupled to electrical ground" and "electrical ground coupled to said electrode" as follows:

1. "Electrical ground" (claim 1 element b; claim 7 element f): "A common reference potential, typically, but not necessarily, at earth potential."

2. "Coupled" (claim 1 element b, c, and d; claim 7 element d, e, and f): "Electrically connected or connected by a conductive path, capacitively, inductively, or by any other means of transferring energy."

3. "Electrode coupled to said electrical ground" (claim 1 element b) and "electrical ground coupled to said first electrode" (claim 7 element f): "a conductive surface providing

an electrical path between reaction volume and electrical ground."

Markman Order at 6.

In accordance with that construction, the Court finds that the Unity series 65 DI and 85 DI etchers literally infringe claims 1 and 7 of the '223 Patent. All elements of each of the asserted claims are met by these etchers. However, the Advanced IEM does not infringe the '223 Patent, either literally or under the doctrine of equivalents. Moreover, TEA's training, support, maintenance, service and sales of replacement parts for any IEM etchers sold since October 1997, constitutes inducement under 35 U.S.C. § 271(b) and contributory infringement under 36 U.S.C. § 271(c).

1. The Unity Series 65DI and 85DI Etchers

An electrode, as defined by this Court, is "any conductive surface, including a metal chamber wall or other surface, coupled to the plasma." Markman Order at 5. Claim 1 of the '223 Patent, which in substance is the same as Claim 7, requires three electrodes, with the first being connected to electrical ground, the second to a source of high-frequency power and the third to a source of low-frequency power. Figure 2 of the '223 Patent reveals that in the invention's preferred embodiment, the second electrode (i.e., the electrode selectively coupled to a high frequency source of AC power) is the chamber wall. *Id.* In the model 65 and 85 DI machines, the chambers are lined with conductive surfaces. Tr. 187:9-189:18. These surfaces are not insulated from one another; that is, they are all grounded in order to

promote plasma stability and, as a result, serve as a single electrode. Tr. 187:23-188:4; 190:13-191:1. Thus, the Court finds that the lining of the chamber wall is an electrode coupled to electrical ground.

Schematic drawings of the model 65 and 85 DI machines all depict the wall of the etcher as grounded. Pl.'s Ex. 41 at TOK035139 (IEM Process Manual). The conductive surfaces lining the wall and interior of the IEM chamber are electrically coupled to the plasma. Tr. 186:24-187:10. Although the density of the plasma may vary inside the chamber, it is able to expand throughout and is thus not confined solely to the area between the upper and lower electrodes. Tr. 182:13-15; 188:1-4. While the greatest concentration of the plasma may be between the electrodes, it does not foreclose the conclusion that the plasma is also present near the chamber wall surfaces. Tr. 193:5-194:7; 442:6-442:8. The electrical coupling between the plasma and the grounded chamber wall surface is part of the circuit design of the etchers at issue. Tr. 210:16-211:25. Power is supplied by generators to the high and low frequency electrodes through two matching networks. Tr. 189:20-190:22. These are the electronic components that enable the plasma to be more efficiently generated. *Id.* The filters in the matching networks of each generator provide a common ground connection between each powered electrode and the conductive wall surfaces of the chamber. *Id.* Thus, all three electrodes in the IEM etchers are connected to a common ground point causing the current in the machines to extend to the wall.

In sum, the Court finds that the Unity series 65 DI and 85 DI etchers have a "first electrode coupled to electrical ground" and an "electrical ground coupled to said electrode." The chambers of the machines have conductive surfaces lining the walls which are isolated from the powered electrodes by insulators and at a common ground reference potential. These conductive surfaces are then coupled to the plasma in that they provide an electrical path between the reaction volume[1] and a common ground reference potential. Accordingly, the Court finds that every element of claims 1 and 7 of the '223 Patent is present in the TEA "Unity System" model DI oxide etcher.

2. The Advanced IEM Etcher

The Advanced IEM etchers utilize two high-frequency power supplies — a 60 MHZ high-frequency power supply, in addition to a 13.56 MHZ high-frequency power supply. Pl.'s Ex. 113 at TOK063875; Takena Dep. 39:10-40:16. Claims 1 and 7 of the '223 Patent, on the other hand, require a high-frequency power supply which operates at greater than about 10 MHZ and a low-frequency power supply which operates at less than about 1 MHZ. "High frequency" and "low frequency;" as used in elements c and d of claim 1, were construed by this Court in its Markman Order in accordance with the '223 specification. Specifically, the Court found that high frequency is any frequency greater than about 10 MHZ, while low frequency is correspondingly used to describe any frequency less than about 1 MHZ. Markman

1. The Court construes the term "reaction volume" to mean the entire area within which the plasma reaction takes place in the vacuum enclosure of the IEM chamber. Tr. 178:20-23.

Order at 6. The Court noted, in the construction of these terms, that the word "about" indicates an *approximate* range. *Id.* "That is, a dual frequency reactor might fall within the scope of the patent even though it utilizes frequencies slightly higher than 1 MHZ and slightly lower than 10 MHZ." *Id.* Tegal's position that the Advanced IEM etcher's 13.56 MHZ power supply is equivalent to the low frequency limitation of less than about 1 MHZ in claims 1 and 7 of the '223 Patent is illogical. 13.56 MHZ is not at or below 1 MHZ. Thus, the Court declines to find that the Advanced IEM etcher infringes the '223 Patent either literally or under the doctrine of equivalents.

3. Willfulness

In order to find willful infringement, the Court is "required to find by clear and convincing evidence in view of the totality of the circumstances that [TEA] acted in disregard of the ['223] patent and lacked a reasonable basis for believing it had a right to do what it did." *Amsted Indus., Inc. v. Buckeye Steel Castings Co.*, 24 F.3d 178, 181 (Fed. Cir. 1994). The Court finds that TEA's continuing infringement of the '223 Patent since the filing of the lawsuit has been willful. TEL knew about the '223 Patent before this action was filed as evidenced by its U.S. Patent 5,698,062 (the '062 Patent), applied for on September 25, 1995, that cites the '223 as prior art. Pl.'s Ex. 199.

In addition, this Court concludes that TEA's infringement was willful based on the communications between TEA and Twinstar Semiconductor, Inc. (Twinstar) from early July to mid-December 1997. Tokyo Electron Yamanashi Ltd. (TYL)

manufactures the IEM etchers in Japan. In response to a report of excessive buildup of unwanted "particles" in IEM etchers sold to Twinstar, TYL tested for plasma activity in the vicinity of the conductive wall and interior surfaces of the reactor. Based on the test results, engineers for TYL, TEA and Twinstar met several times and exchanged a series of communications discussing the causes of the "particle" problems in Twinstar's IEM machines. The problems were eventually attributed to plasma attacking conductive surfaces along the wall and the interior of the IEM chamber. Pl's Ex. 148; *see also* Pl.'s Ex. 122-123. The documents clearly state that these surfaces were serving the function of a ground electrode. In fact, most telling, was a presentation slide developed by Twinstar which stated, "Stop deceiving yourself — electrode must be regarded as electrode." Pl.'s Ex. 123 at TOK064057. Yet another slide stated, "The Ion Flux seems to result from Electrode nature of the parts." Pl.'s Ex. 122 at TOK064043. These communications from Twinstar provided TEA with sufficient information so that it should have been aware of the infringement, as TEA was clearly familiar with the '223 Patent by this point in time.

C. Defenses to Infringement

1. Inequitable Conduct

a. Standard of Review

Inequitable conduct consists of the failure to disclose material information, the affirmative misrepresentation of a material fact or the submission of false material information, in addition to an intent to deceive or mislead the PTO. *Kolmes*

v. World Fibers Corp., 107 F.3d 1534, 1541 (Fed. Cir. 1997) (citations omitted). One alleging inequitable conduct must prove the threshold elements of materiality and intent by clear and convincing evidence. *Id.* at 1542. Specifically, a party must show that the patent applicant (1) withheld material information from, or disclosed materially false or misleading information to, the patent examiner and (2) intended thereby to deceive or mislead the examiner into granting the patent. *Herbert v. Lisle Corp.*, 99 F.3d 1109, 1115 (Fed. Cir. 1996). The intentional failure to disclose material information constitutes inequitable conduct before the PTO, and renders a patent unenforceable. *Molins PLC v. Textron, Inc.*, 48 F.3d 1171, 1178, n. 6 (Fed. Cir. 1995).

The Federal Circuit defines information as material "if a reasonable examiner would have considered it important to the patentability of a claim." *Regents of University of Cal. v. Eli Lilly & Co.*, 119 F.3d 1559, 1570 (Fed. Cir. 1997) (citations omitted). By definition, information that is cumulative, does not help to establish a prima facie case of unpatentability or is consistent with arguments made to the PTO regarding patentability, is not material.[2] 37 C.F.R. § 1.56 (Rule 56). In the presence of very material omissions or misrepresentations, less evidence is needed to show intent.

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2. Undisclosed prior art is not considered material if it less relevant than or cumulative to art that was considered by the PTO. *Engel Indus., Inc. v. Lockformer Co.*, 946 F.2d 1528 (Fed. Cir. 1991). One has to consider both the similarities and the differences between the prior art and the patent claims at issue in order to determine whether the prior art reference is material. *Halliburton Co. v. Schlumberger Technology Corp.*, 925 F.2d 1435, 1441 (Fed. Cir. 1991).

Gambro Lundia AB v. Baxter Healthcare Corp., 110 F.3d 1573, 1580 (Fed. Cir. 1997).

It is important to note that in many cases no direct evidence exists to establish an intent to deceive the PTO. Thus, courts often rely on circumstantial evidence to infer such intent. *See Hewlett-Packard Co. v. Bausch & Lomb, Inc.*, 882 F.2d 1556, 1562 (Fed. Cir. 1989), *cert. denied*, 493 U.S. 1076 (1990). However, more than negligence is needed for a finding of an intent to deceive the PTO. The accused conduct, when viewed in light of all the evidence, including evidence of good faith, must exhibit "sufficient culpability to require a finding of intent to deceive." *Kingsdown Medical Consultants, Ltd. v. Hollister, Inc.*, 863 F.2d 867, 876 (Fed. Cir. 1988) (*en banc*), *cert. denied*, 490 U.S. 1067 (1989).

b. Analysis

TEA alleges that Tegal engaged in inequitable conduct during the reexamination of the '223 Patent. The initial application for the '223 Patent was filed by George Gorin on October 3, 1983 with the United States Patent Examiner. Pl.'s Ex. 1. Prosecution of the patent was handled by Paul Wille, a patent lawyer in Motorola's legal department. Pl.'s Ex. 3. The '223 Patent was issued on August 7, 1984. Pl.'s Ex. 1. To obtain worldwide coverage, Tegal filed various applications in other countries to obtain foreign counterpart patents, including an application in Japan filed on June 25, 1984. In late 1988, Tegal filed a lawsuit in the United Kingdom against a competitive etcher manufacturer for violation of the European counterpart of the '223 Patent. Pl.'s Ex. 14; Dep. of Paul Wille (Wille Dep.) 51:18-57:1. During

this lawsuit, a number of prior art references that had not been considered in the United States prosecution of the '223 Patent surfaced. As a result, Tegal initiated reexamination proceedings before the PTO in December of 1988. Pl.'s Ex. 2.

Six pieces of prior art were submitted for consideration during the '223 Reexamination,[3] supplementing four prior art references from the original proceedings on the '223.[4] While these proceedings were still in progress, the Japanese Patent Office ("JPO") issued an initial disallowance of Tegal's application for a Japanese counterpart on June 12, 1990. Pl.'s Ex. 10. The JPO cited three prior art references.[5]

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3. Those references were Pl.'s Ex. 21 Cotton, 2,468,174 (April 26, 1949), Pl.'s Ex 19 Cooper et. al., 3,458,817 (July 29, 1969), Pl.'s Ex. 14 Mikio et al., Eur. Pat. Off. 0026604 (September 15, 1980) (referred to in the '223 Reexamination as "Fujitsu"), Pl.'s Ex. 22 Chapman, "Triode Systems for Plasma Etching," IBM Technical Disclosure Bulletin, vol. 21, No. 12 (May 1979); and Pl.'s Ex 23 Minkiewicz et. al., "Triode Plasma Etching," Applied Physics Lett. 34 (3), February 1979.

4. Those references are Pl.'s Ex. 15 (Nishizawa, U.S. Patent No. 4,233,109 (November 11, 1980)); Pl.'s Ex. 18 (Shibayama, U.S. Patent No. 4,349,409 (September 14, 1982)); Pl.'s Ex. 17 (Tsukada, U.S. Patent No. 4,352,725 (October 5, 1982)); and Pl.'s Ex. 16 (Tsukada et. al. U.S. Patent No. 4,399,016 (August 16, 1983)).

5. *See* Pl.'s Ex. 10 at 1 (citing Japanese Patent Kokai Gazette No. 131374(1982) and Japanese Patent Kokai Gazette No. 127168(1977)), and 2 (citing Japanese Patent Application No. 686361 (1982). No. 131374 is the "NTT reference" (inventor Sato). No. 127168 was the "Fujitsu reference" (inventor Itoga)).

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On September 12, 1990, Tegal referred the U.S. PTO to the Fujitsu publication that was cited by the JPO, but not the NTT reference. Def.'s Exs. 35 & 36. On April 9, 1991, the U.S. PTO issued a reexamination certificate for the '223 Patent. Pl.'s Ex. 2. Eventually, the JPO reversed its position and granted Tegal a patent on the '223 counterpart application. TEA alleges that Tegal was able to obtain this Japanese patent only after it amended the language of its Japanese claims to "avoid" the NTT reference.

TEA asserts that Tegal breached its duty of disclosure by withholding from the U.S. Patent Examiner the NTT publication cited against Tegal during the prosecution of the '223 Japanese patent proceedings. Specifically, TEA contends that Tegal's failure to cite the NTT reference in September 1990 was a materially misleading omission. The Court finds that TEA fails to support these allegations by clear and convincing proof. TEA must establish both materiality and intent to deceive in order for this Court to find inequitable conduct. There is no substantial evidence in this case to support a finding of either the withholding of material information or an intent to deceive.

First, there is no evidence that Tegal actually intended to mislead the PTO. Mr. Wille acknowledges receiving a one-page English abstract of the NTT reference in late July or August, 1990. Pl.'s Ex. 5; Wille Dep. 73:20-74:8; 130:6-9; Tr. 637:15-638:5. But TEA's experts, Mr. James Gambrell and Dr. Herbert Sawin, focused upon specific language taken from a fully translated version of the NTT to support their opinions that the NTT reference was material. Tr. 640:21-642:3. TEA did not establish that Mr. Wille had any

knowledge of the specific language from the NTT reference that Mr. Gambrell and Dr. Sawin relied upon in forming their opinions.

Second, TEA has failed to establish that the NTT reference was material. In deposition, Mr. Wille stated that based upon the limited information he had about the NTT reference, he concluded that it was a dual frequency diode. Wille Dep. 170:8-22. Since the PTO had already been apprised of a dual frequency diode with the Fujitsu-Takagi reference, Mr. Wille decided that the NTT reference was cumulative to the prior art of record. Wille Dep. 170:8-22; 74:6-15. Although Dr. Sawin offered a contrary opinion at trial, both Dr. Chapman and Mr. Robert K. Waits testified that the NTT adds nothing to Fujitsu-Takagi. Tr. 689:25-690:14; Waits Dep.(10/28/98) 167:10-169:7. Thus, TEA's evidence on the issue of materiality does not meet the clear and convincing standard of proof.

2. Invalidity under 35 U.S.C. § 102(b)

a. Standard of Review

Once a patent issues, it is presumed valid. 35 U.S.C. § 282. The purpose of this presumption is "to contribute stability to the grant of patent rights." *Magnavision, Inc. v. Bonneau Co.*, 115 F.3d 956, 958 (Fed. Cir. 1997). The presumption operates by placing the burden of proving invalidity by clear and convincing evidence on the person attacking the patent.[6] *Id.*

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6. "[T]he evidence presented by the challenger must be of such quality and weight as to establish invalidity despite the presumption." *Id.*

A party seeking to invalidate a patent on the ground of anticipation under 35 U.S.C. § 102(b)[7] bears an even heavier burden of showing by clear and convincing evidence that each and every element of the claimed invention is disclosed in a single "prior art reference," i.e., an earlier patent or a printed publication. *Applied Medical Resources Crop. v. United States Surgical Corporation*, 147 F.3d 1374, 1378 (Fed. Cir. 1998); *Solarex Corp. v. Arco Solar, Inc.*, 805 F.Supp. 252, 259 (D. Del. 1992). Mere similarity will not suffice. "There must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of invention." *Scripps Clinic & Research Fdn. v. Genentech*, 927 F.2d 1565, 1576 (Fed. Cir. 1991). If any claimed element is absent from the reference, there is no anticipation. *Rowe v. Dror*, 112 F.3d 473, 478 (Fed. Cir. 1997) (citations omitted).

b. Analysis

TEA contends that claims 1 and 7 of the '223 Patent are invalid for anticipation. In support of this defense, TEA cites the Itakura reference and asserts that it discloses each and every limitation of claims 1 and 7 of the '223 Patent. The Court finds that TEA has failed to overcome the presumption of validity that is attached to the '223 by clear and convincing evidence. Itakura does not contain each and every element in the contested claims of the '223. It does not disclose three

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7. "A person shall be entitled to a patent unless . . . (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States . . . ." 35 U.S.C. § 102(b).

electrodes; rather, Dr. Sawin testified that a third electrode is "implicit" in Itakura, but he pointed to no teaching in the patent to support his claim. Tr. 598:16-600:13. Itakura actually discloses two plasmas separated by a metal grid with very small holes. Tr. 584:4-586:10. In addition, there is no single "plasma" or single "reaction volume," and there is nothing to indicate that it has a "workpiece located within the reaction volume" that claim 7 specifically requires. Accordingly, this defense is without merit.

3. Invalidity under 35 U.S.C. § 103

a. Standard of Review

Invalidity based on obviousness is a question of law based on the underlying facts. *See Granham* [sic] *v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). The underlying facts relate to (1) the scope and content of the prior art, (2) the level of ordinary skill in the field of invention, (3) the differences between the claimed invention and the prior art, and (4) any objective evidence of nonobviousness, such as long felt need, commercial success, the failure of others to find a solution or copying of the invention by others. *Id.* at 17; *see C.R. Bard Inc. v. M3 Systems, Inc.*, 157 F.3d 1340,1351 (Fed. Cir. 1998). "To establish a prima facie case of obviousness based on a combination of the content of various references, there must be some teaching, suggestion or motivation in the prior art to make the specific combination that was made by the applicant." *In re Dance*, 160 F.3d 1339, 1343 (Fed. Cir. 1998) (citations omitted); *see Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 934 (Fed. Cir. 1990) (it is insufficient that prior art shows similar components, unless it also

contains some teaching, suggestion, or incentive for arriving at the claimed structure).

b. Analysis

In support of its claim that the '223 Patent is invalid for obviousness, TEA cites the NTT reference, the Itakura reference, and the Ephrath reference. Upon review of the materials presented to the Court, it is clear that the '223 is not rendered obvious by any one or any combination of these prior art references. The NTT reference does not disclose a chamber wall and it would not have been obvious to one of ordinary skill in the art in 1983 to convert the NTT etcher into a triode configuration with a metal wall serving as a third electrode. Tr. 252:8-14; 294:21-295:11; 298:3-17. The NTT teaches away from this conversion by disclosing an apparatus that is designed to be a self-contained diode system, with each of the two powered electrodes serving as an "equivalent ground" for one another. Tr. 253:3-22. Itakura also teaches away from the '223 invention, since it fails to disclose anything about independent control of ion density and ion energy. Tr. 289:18-291:17. Finally, Ephrath discloses nothing more than Itakura and makes no mention of low frequency. Tr. 490:9-491:15.

In addition to the above, there are also a great deal of objective evidence of non-obviousness. First, there was a long-felt need for the '223 invention. Mr. DeOmellas testified to the need in the early 1980s for etchers that could perform anisotropic etching, yet would have independent control of ion density and ion energy. Tr. 90:19-92:5. This was an enabling step to smaller feature sizes on wafers. *Id.* Second,

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Dr. Chapman testified that, prior to the '223 invention, he and others in the industry had been working on the problem of independent control of ion energy and plasma density. Tr. 244:21-246:21. According to Dr. Chapman, George Gorin was the first to design a commercially successful machine with that capability. Tr. 247:3-21. Third, both Mr. DeOrnellas and Dr. Chapman testified that the Tegal 1500, which practiced the '223 invention, enjoyed commercial success. Tr. 88:19-89:16; 92:23-93:3; 108:19-21; 247:3-7.

II. THE '920 PATENT

A. Analysis

Tegal asserts that TEA's PE and IEM etchers literally infringe claim 1 of the '920 Patent. Claim 1 reads as follows:

> Planar RF plasma reactor apparatus comprising:
>
> [a] a frame member having an aperture therein;
>
> [b] a shell secured to said frame about said aperture;
>
> [c] an upper electrode which fits within said shell, at least a portion of said electrode being electrically coupled to said shell;
>
> [d] retaining means attached to said shell for holding said electrode in place; and

> [e] wherein said aperture is larger than said electrode in at least one dimension for enbaling [sic] removal of said electrode through said aperture without separating said shell and said frame.

There are only two contested factual issues with respect to the above language: (1) whether TEA's screws and shield ring infringe the means-plus-function language of the '920's "retaining means," and (2) whether TEA's electrode is removed through the aperture in the frame. The evidence fails to establish infringement in either instance.

1. Retaining Means

Claim 1 of the '920 Patent includes the following "means plus function" element: "retaining means for holding said electrode in place." Pursuant to 35 U.S.C. § 112, ¶ 6, a claim construed in this fashion shall cover "the corresponding structure, material, or acts described in the specification and equivalents thereof." To determine whether a claim limitation in means-plus-function form is met literally, "[t]he court must compare the accused structure with the disclosed structure, and must fund equivalent structure as well as identity of claimed function for that structure." *Pennwalt Corp. v. Duran-Wayland Inc.*, 833 F.2d 931, 934 (Fed. Cir. 1987) (*en banc*). The breadth of equivalents accorded to a means-plus-function limitation under 35 U.S.C. § 112, ¶ 6, is determined by reference to the patent specification, the prosecution history, other claims in the patent, expert testimony when applicable, and the language of the asserted claim. *King Instrument Corp. v. Otari Corp.*, 767 F.2d 853, 862 (Fed. Cir. 1985), *cert. denied*, 475 U.S. 1016 (1986).

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The function of the retaining means in claim 1 of the '920 Patent is "for holding said electrode in place." The specification for the '920 Patent describes three structures for holding the electrode in place: an isolation ring (item 54), a retaining ring (item 53), and bolts (item 82). As a result, this Court's Markman Order construed "retaining means" as follows:

> "Retaining means" (element d): The structure which holds the upper electrode in place within the bottom rim of the shell. The structure consists of three components, an isolation ring, a retaining ring, and a set of bolts.

Markman Order at 10.

The Court finds that the accused TEA etchers do not include the '920 retaining means structure or an equivalent of that structure. The structure of the TEA etchers which performs the "retaining means" function of the '920 Patent consists solely of twelve bolts which extend through the upper electrode. Tr. 399:3-10; 505:18-20; 507:13-20. The '920 specification, on the other hand, describes a retaining arrangement which eliminates screws or bolts extending through the electrode:

> The electrode is plain, i.e. characterized by the absence of any means for fastening it, e.g. enlarged bores for bolts, threaded portions or the like. Electrode 56 must be held in place by another, appropriately shaped member which is adapted for being fastened to shell 52. As illustrated in

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> FIG . 2, isolation ring 54 holds electrode 56 in place and retaining ring 53 is attached to shell 52, fastening both electrode 56 and isolation ring 54.

Pl.'s Ex. 5, col. 3, lines 50-58. Contrary to Tegal's assertions, the shield ring of TEA's etchers is not part of the retaining means as it does not perform the '920's claimed function of "holding said electrode in place." Tr. 157:5-158:14. Rather, the shield ring of the TEA Etchers and Model 85DP performs a number of other functions, including isolating the retaining screws from the plasma. Tr. 511:6-23. Finally, as the inventor of the '920 chose specifically to avoid the use of screws extending through the electrode in the retaining means structure, Tegal cannot now assert that screws extending through the TEA electrodes are equivalent. Due to the substantiality of the differences, it cannot be said that the "retaining means" clause is met literally or by equivalent in the TEA Etchers and Model 85DP.

2. Removal of Electrode through the Aperture

The final element of Claim 1 of the '920 Patent is as follows:

> wherein said aperture is larger than said electrode in at least one dimension for enabling removal of said electrode through said aperture without separating said shell and said frame.[8]

Pl.'s Ex. 5 at Col. 5:30-5:33.

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8. This Court construed "aperture" as follows:

(Cont'd)

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There is no dispute that the TEA electrodes sit slightly below the frame member of the etcher. Pl.'s Ex. 41 at TOK035141; Def's Ex. 169, 170. During the trial of this matter, TEA presented an actual TEA etch chamber which was disassembled for the Court to view. Def.'s Ex. 1. Alan D. Nolet, General Manager of Semiconductor Production Equipment for TEA, testified, using the disassembled etch chamber, that, upon removal, the TEA electrode does not pass through the aperture of the frame. Tr. 384:5-9; 399:11-14. Tegal's expert, Dr. Waits, acknowledged that the electrode in the TEA configuration sits below the frame. Tr. 166:17-19. Since the TEA electrode sits below the frame, it is physically impossible for the electrode to go through the aperture of the frame without separating the shell from the frame. Tr. 508:3-17. Thus, there is no literal infringement.

As for infringement under the doctrine of equivalents, the Court finds that there is not an insubstantial difference between the TEA Etchers and Model 85DP wherein the electrode clearly sits below the frame member and Tegal's '920 claim 1 limiting structure. During the prosecution history of the '920 Patent, Tegal amended claim 1 to recite that the electrode is removed through the frame member. Def's Ex. 12, October 3, 1983 Amendment at p. 4. This amendment was submitted by Tegal in order to distinguish

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(Cont'd)

> A hole in the frame member which permits removal of the upper electrode from the bottom of the shell by pulling the electrode through the aperture, without separating the shell from the frame.

Markman Order at 11.

the claim from the prior art. *Id.* This same argument was presented to the Examiner later on in the proceedings:

> As a final attempt to advance the prosecution before the Examiner, applicant has amended claim 21 to expressly recite that the electrode is an upper electrode and that the electrode is removed through the aperture as defined.

Def.'s Ex. 12, May 8, 1995 Amendment at p. 3. These amendments effectively excluded arrangements in which the electrode is not removed through the frame aperture from the scope of '920 claim 1 in order to obtain allowance. As a result, the prosecution history of the '920 Patent estops Tegal from establishing that TEA's accused etchers have an equivalent structure to the '920 claim 1 limitation that states that the electrode is removed through the frame aperture. Accordingly, TEA's accused etchers do not have a literal or equivalent structure to claim 1 of the '920 Patent.

Let the Clerk send a copy of this Findings of Fact and Conclusions of Law to all counsel of record.

And it is SO ORDERED.

s/ James R. Spencer
UNITED STATES DISTRICT
JUDGE

AUG 31 1999
DATE

Appendix B

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF VIRGINIA
RICHMOND DIVISION

Case number: 3:98CV318

Tegal Corporation,

Plaintiff,

v.

Tokyo Electron Limited,

Defendant.

JUDGMENT IN A CIVIL CASE

* * *

☒ **Decision by Court.** *This action came to trial or hearing before the Court..The issues have been tried or heard and a decision has been rendered.

IT IS ORDERED AND ADJUDGED that Judgment is entered in favor of Tegal Corp., and against Tokyo Electron America, Inc. for costs incurred in connection with its prosecution of the 223 Patent.

August 31, 1999
Date

Norman H. Meyer, Jr.
Clerk

s/ [illegible]
(By) Deputy Clerk

APPENDIX C — ORDER OF THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF VIRGINIA, RICHMOND DIVISION, DATED AND FILED MAY 24, 1999

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF VIRGINIA
RICHMOND DIVISION

Civil Action Number 3:98CV318

TEGAL CORPORATION

Plaintiff.

v.

TOKYO ELECTRON LIMITED

Defendant.

ORDER

THIS MATTER comes before the Court on Defendant Tokyo Electron Limited's Motion for Reconsideration of a May 20, 1999 Order that Trial will proceed as a Non-Jury Trial. Upon due consideration, the Court hereby DENIES the motion. The Court finds that there are no issues remaining in this matter that require a trial by jury. Trial will proceed as scheduled before the Court. In addition, the Court will require the parties to submit Findings of Fact and Conclusions of Law. A filing date for these pleadings will be determined by the Court at the conclusion of trial.

Appendix C

Let the Clerk send a copy of this Order to all counsel of record.

And it is SO ORDERED.

s/ James R. Spencer
UNITED STATES DISTRICT
JUDGE

MAY 24 1999
DATE

APPENDIX D — ORDER OF THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF VIRGINIA, RICHMOND DIVISION, DATED MAY 19, 1999 AND FILED MAY 20, 1999

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF VIRGINIA
RICHMOND DIVISION

Civil Action Number 3:98CV318

TEGAL CORPORATION

Plaintiff.

v.

TOKYO ELECTRON, LTD.

Defendant.

ORDER

THE COURT is in receipt of correspondence from Plaintiff Tegal Corporation that indicates that it has decided not to pursue its damages claim further in this case. By withdrawing its damages claim, Tegal loses its right to a trial by a jury, as no actions at law remain as either affirmative claims or counterclaims. Upon due consideration, the Court WILL PROCEED as scheduled with trial. However, trial will be before the Court ONLY and will begin at 9:30 a.m. on Wednesday, May 26, 1999.

Appendix D

Let the Clerk send a copy of this Order to all counsel of record.

And it is SO ORDERED.

s/ James R. Spencer
UNITED STATES DISTRICT
JUDGE

MAY 19 1999
DATE

APPENDIX E — ORDER OF THE UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT DENYING PETITION FOR REHEARING DATED AND FILED SEPTEMBER 4, 2001

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

00-1009

TEGAL CORPORATION,

Plaintiff-Appellee,

v.

TOKYO ELECTRON AMERICA, INC.,

Defendant-Appellant.

ORDER

A petition for rehearing en banc having been filed by the APPELLANT, and the matter having first been referred as a petition for rehearing to the panel that heard the appeal, and thereafter the petition for rehearing en banc having been referred to the circuit judges who are in regular active service,

UPON CONSIDERATION THEREOF, it is

ORDERED that the petition for rehearing be, and the same hereby is, DENIED and it is further

Appendix E

ORDERED that the petition for rehearing en banc be, and the same hereby is, DENIED.

The mandate of the court will issue on September 11, 2001.

FOR THE COURT

s/ Jan Horbaly (AV)
Jan Horbaly
Clerk

Dated: September 4, 2001